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Role of Urban Agriculture to Increase Food Security and Economic Resilience of Refugees and Vulnerable Host Communities

The case of Syrian refugees in Bourj Hammoud, Lebanon

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of Refugees and Vulnerable Host Communities**

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Abstract

Food insecurity, poor nutrition and poverty are closely linked and entail adverse consequences for the health and well-being of children and adults. They constitute major constraints to development efforts as they can imply lifelong negative effects on human development with impairments on physical and mental capacities of a population, resulting in an overall lower productivity and economic growth potential.

Urban agriculture has been advocated as a strategy to improve food security. This paper exemplifies an urban gardening project that addresses food security and economic resilience of the Syrian refugees and vulnerable Lebanese host communities executed in the suburbs of Beirut. The hypothesis underpinning this study is that urban agriculture holds the potential to contribute to increased food security and reduced urban poverty, by increasing the availability and accessibility to a variety of fresh foods that are rich in vital nutrients and by functioning as a source of livelihoods and income.

The brutality of the Syrian Civil War, its massive damage and destruction of housing and persecutions for ethnic cleansing led more than a quarter of its originally 24 million inhabitants to seek safety in neighboring countries and Europe. The war has severely hampered the stability and development throughout the region as hundreds of thousands of refugees have fled to neighboring countries where they often compete with host communities over housing, labor, water, food and land. In relative numbers the biggest burden fell on the riparian country Lebanon, currently holding the highest ratio of refugees to nationals in the world. The small Arab country has already been suffering from many pre-existing challenges as food insecurity and widespread poverty.

The high dependence on food assistance, limited access to income and uncertainties on the amount of food aid provided in each upcoming year, all contribute to an unstable and low food security status of Syrian refugee households in Lebanon with spill overs to vulnerable host communities. In 2017, 91% of Syrian families residing in Lebanon remained food insecure to some degree and the share of household's falling into severe food insecurity keeps increasing with every year.

These numbers provide clear evidence that current efforts of providing food assistance are not sufficient to combat the repercussions of the crisis and get the situation under control.

The paper displays the impact of the urban gardening project on the food security and economic resilience of participating household's, as well as lessons learned on the project design during and after the implementation phase. The sampling frame is comprised of Syrian and Lebanese families participating in the project. Primary data were derived from a survey using a questionnaire with a sample size of 41 households. The findings aim to enable stakeholders to improve the performance of similar projects in the future and support relevant government authorities, international aid institutions, non-profits and the civic society towards creating sustainable long-term solutions to increase the self-reliance of refugees by providing insights of the suitability of UA for multiple objectives and by highlighting potential challenges and risks.

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List of Abbreviations

cm ²	square centimeters
FAO	Food and Agricultural Organization of the United Nations
ha	hectares
hh	households
m ²	square meters
m ³	cubic meters
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
sq km	square kilometer
sq m	square meter
U.S.	United States
UNDP	United Nations Development Programme
UNHCR	United Nations Higher Commission for Refugees
US \$	US Dollar
USDA	United States Department of Agriculture
WFP	World Food Programme

1 Introduction

Since the outbreak of the Syrian crisis in 2011, the conflict has turned into one of the most severe humanitarian emergencies since the Second World War. The ongoing fights have caused hundreds of thousands of casualties and left more than 13 million people in need. Currently it is estimated that 6,6 million Syrians are internally displaced and at least 5,6 million have fled to the nearby countries as Turkey, Lebanon, Jordan, Iraq and Egypt and Europe (UNHCR, 2018).

In relative numbers, the biggest burden fell on Syria's neighboring country Lebanon which now has the highest nationals to refugees' ratio in the world with one refugee per four citizens (Kabalan, 2016). Being a small Mediterranean country of only around 10.000 km², the refugee spillover has not only caused the need for humanitarian intervention but has also assumed alarming proportions on the economic and social spheres of the country which is becoming an increasing burden for authorities and host communities alike.

Lebanon's weak central government structures and the absence of a comprehensive response strategy lead humanitarian institutions to directly cooperate with municipal authorities to ensure rapid and effective aid assistance. However, with the prolong of the crisis and rapidly increasing numbers of refugees during the first years of the crisis, the capacities of the local municipalities have been reaching their limits with the result of despair and frustration of all involved stakeholders (UNHABITAT & UNHCR, 2014).

A lack of housing and the urgent need for shelter pushed many Syrian families into dire living conditions, often seeking refuge in places not designed as shelter. This, in turn, made it more difficult for aid organizations and the UNHCR to reach those most in need. Up to today, constraints faced by refugee families in Lebanon include insecure resident permits and legal status, low job opportunities and a lingering fear of eviction.

Host communities also suffer from the implications of the crisis. Increased competition over affordable housing and employment opportunities, strained infrastructure, health and education services have pushed vulnerable host populations into precarious situations with growing hostility towards the vulnerable refugee community (FAO, 2014).

While registered refugees received aid by the UNHCR and the World Food Programme (WFP) since 2011, vulnerable hosting communities were left completely on their own for the first 5 years of the crisis. A double tragedy was and is still taking place, as the most detrimental effects are beared by those who are already the most vulnerable members of both Syrian and Lebanese communities. High poverty rates and food insecurity affecting up to 91% of the Syrian refugee population in Lebanon are the adverse consequences of this prolonged state of exception (VASyR, 2017). In fact, the Syrian Crisis is only one of the many ongoing conflicts in the world. These incidents pose a great threat to successfully combat hunger and poverty in the world, two major goals of the Sustainable Development Goals¹ by the United Nations, or might even result in reversing already achieved efforts.

1.1 Problem Statement

Lebanon is a country where food availability is relatively safe. Around 80%-90% of food is imported and in general there are sufficient food supplies for its population (Bankmed, 2016). However, the economic access to food is hampered as food prices all over the country are very high posing a key problem to refugees and deprived local host communities. FAO (2015a) reports that the food prices have been continuously increasing over the last years while the quality being offered is rather poor. In 2013 and 2014 the amount of debts of the Lebanese population have risen which, according to FAO, was one of the main reasons that food prices increased and with it the populations expenses for food (FAO, 2015). Before refugees started to stream into

¹A collection of 17 global goals set by the United Nations in 2015. The overall objectives are to end poverty, protect the planet and ensure prosperity for all as part of a new sustainable development agenda. Each goal has specific targets to be achieved over the next 15 years (United Nations, 2015).

the country, low-income Lebanese families spent one third of their income on food (IFI, 2014). A number indicating that they are highly vulnerable to food prices fluctuations.

A great number of Syrian refugees residing in Lebanon are women (24%) and children (55%) (UNHCR, 2018). A fifth of the refugee families in Lebanon are headed by women with little or no access to the labor market, making them highly dependent on food aid (Amnesty International, 2016). Those refugee households who managed to participate in the labor market, however, often earn not enough to obtain sufficient food for all family members and so they rely on additional food aid as well.

High dependence on food assistance, limited access to income and uncertainties on the amount of food aid provided in each upcoming year, as unforeseen humanitarian crisis around the world constantly arise, all contribute to an unstable and low food security status of Syrian refugee households in Lebanon. In 2015, for example, the monthly transferred US\$ 27 by the WFP had suddenly to be dropped by 50% for several months due an urgent reallocation of aid (WFP, 2017d). This was a shock for many households and drove them into a period of very dire conditions.

While the WFP supported 650.000 people in 2017, a total of 1.395.000 Syrians is estimated to be in need for food assistance (FSCluster, 2017). Thus, almost 50% are currently without assistance which implies that there is still a great number of people who can not rely on external aid to meet their needs.

The implications of the insufficiency of food aid provided is captured in the “Vulnerability Assessment of Syrian Refugees in Lebanon” (VASyR) put together annually by the UNHCR, WFP and UNICEF. The report shows that in 2017, an overwhelming number of 91% of Syrian refugee households suffered from some degree of food insecurity. An improvement of only 2% compared to the previous year.

The same problem applies for the Lebanese population. Pre-war estimations hover around a food insecurity rate of 15%-20% (IFI, 2014) but up to date data are rare. It is however expected, that the crisis has exacerbated their situation.

Thus, even though international organizations are continuously improving their interventions and the Lebanese government is becoming more involved since 2017, the food insecurity levels of the concerned population clearly indicates that the efforts are not sufficient to combat the repercussions of the crisis and get the situation under control. As example, the number of households suffering from severe food insecurity household keeps increasing and reached 38% in 2017, 2 percent points more than in the previous year (VASyR, 2017).

Throughout the world, households that suffer from food insecurity exhibit a range of coping strategies, seeking to ease their situations but also reflecting their state of vulnerability. Such strategies can be differentiated into negative and positive coping strategies. While former tend to increase the vulnerability of a household, the latter does not further affect a households already fragile situation. Borrowing food from neighbors or friends would be an example for a positive coping strategy. In the case of Lebanon, a total of 97% of Syrian refugee households applied negative coping strategies in 2016 as a response to their lack of food (WFP, 2016a). The two dominant applied coping strategies were to buy less preferred/ less expansive food (92%) and to reduce the number of eaten meals (58%). Borrowing food from friends or relatives was reduced in 2016 to 38%, a drop of 15 percent point compared to 2015. In return, reducing meal portions for adults increased by 6 percent points to a total of 33% (WFP, 2016a).

The most common non-food related coping strategies were buying food on credit (77%), reducing essential non-food expenditures (76%), to spend savings (34%) and to sell household goods (34%) which result in a depletion of the households already scarce resources, pushing these refugee families further into poverty and undermining their food security. Summing this up, 7 out of the 8 commonly applied coping strategies among refugee families are categorized as negative while the only positive coping strategy drastically declined.

Enabling a household to grow its own food, in contrast, can be an example for a positive coping strategy as it increases assets instead of depleting them. It boosts a household's self-reliance and can positively contribute to a household's food security if well practiced. In fact, home gardening in its various forms is in many developing countries practiced to alleviate hunger and mal-

nutrition. In urban and peri-urban areas home gardens are referred to as the practice of urban agriculture (UA).

For the urban poor, UA mainly serves as a strategy to improve their livelihoods, food security and well-being. UA can either provide them access to food in times of shortage, instability or uncertainty or serve as a constant supply of produce while surpluses can be sold on markets to generate income.

The Environmental and Sustainability Development Unit (ESDU) of the American University of Beirut's (AUB), with the support of two other organizations, has jointly developed such an approach in the form of an urban gardening initiative in Beirut's municipality Bourj Hammoud. 73 Refugees and their vulnerable host communities were provided with gardening kits, seeds, compost units and technical training to grow fresh fruit and vegetable on their rooftops and balconies. The official aim of the project was to build the food security and economic resilience of Syrian refugees and vulnerable members of their host communities. The installation of the urban gardens was carried out from September 2015 to December 2016. The project was designed in a way that during this phase work-shops and continuous supervision would strengthen the gardening capacities of the participating to a level that they enable them to independently carry on with their garden activity.

The focus of this study is to evaluate in how far these objectives have been met and to analyze the potential of urban agriculture activities for refugees and their vulnerable host communities.

The subject of this paper is to evaluate an urban gardening project for refugees and their vulnerable Lebanese host population executed in the suburbs of Beirut, that exemplifies how urban agriculture can play a role to alleviate food insecurity and foster economic resilience among vulnerable urban communities.

1.2 Objectives

In Lebanon poor and vulnerable Syrian and Lebanese communities affected by the Syrian crisis experience insufficient access to food causing severe risks of long-term implications on their health and livelihood opportunities. Urban gardening is advocated as a viable solution to improve food security and economic resilience as it enables concerned households to independently produce fresh and nutrient-rich fruits and vegetables.

The aim of this study is to investigate the contribution of an urban agriculture project to the food security and economic resilience for Syrian refugees and their vulnerable Lebanese host communities with the objective to build a base of knowledge and to provide recommendations for stakeholders on how to improve for similar projects in the future.

The specific objectives of the study are:

(I) Evaluate the impact of the project on beneficiary households:

- a) Assess the state of food security among the project participants
- b) Identify effect of project on food and nutrition security of participant's households
- c) Identify impact of the project on economic resilience of participant's households

(II) Determine factors that can improve similar projects in the future

The first objective comprises an evaluation of the urban gardens contribution to the food security and economic resilience of the participating households. In detail this is done by examining the food security status of the project participants six months after the project implementation has ended. A second component is to analyze the effects of the project on participating household's food and nutrition security. To do so several indicators have been developed that measure the changes in accessibility and quality of available fresh foods, changes in purchase patterns, consumptions patterns and dietary diversity as well as analyzing the nutritional health benefits of the different food types grown by participants.

The third constituent is to look at the project outcome from an economic angle by examining if and in which ways economic resilience could be built through the urban gardens. This is done by collecting data on how much money was generated from selling gardening produce, if food

expenditures were reduced through supplementing meals with own produce and for what purpose possibly saved money was dedicated to.

The second objective is to identify successes, weaknesses, challenges and opportunities of the urban garden project. Through this analysis stakeholders are sought to be informed which issues related to several key areas need to receive special attention and what needs to be addressed to enhance and expand the capacity of similar urban agriculture initiatives in the future.

1.3 Research Questions

The following research questions have been identified to achieve the research objectives:

- [1] What is the prevalence, severity and duration of food insecurity among participant's households?
- [2] Do the urban gardens increase the availability of food and calories among participant's households?
- [3] Do the urban gardens contribute to increased fruit and vegetable intake and increased dietary diversity among participant's households?
- [4] What impact does gardening have on female participants? What are possible positive implications from that for the food security of their households?
- [5] Did cash availability of households increase through their urban garden activity? How did the participants spend this extra cash?
- [6] What are the lessons learned from the project?

1.4 Justification of Study

With a growing world population and a rural to urban migration observed globally, urban farming has increasingly gained popularity and importance. Pillars of food security are availability, accessibility and stability of those two aspects over time. Urban agriculture holds the potential to contribute to increased food security through the opportunity of complementing often staple-based purchased food with a variety of fresh produce.

While it is not easy to reach complete self-reliance with home production, it however enables an easier access to fresh plants in urban locations. Through home gardens households can be equipped with easy day-to-day access to a variety of fresh and nutritious food (Marsh, 1989). Studies on households practicing home gardening in developing countries have shown that these households consume a higher variety of fruits and vegetables compared to non-farming households (Zezza&Tasciotti, 2010). Consuming a variety of fresh produce can positively contribute to a person's nutritious and caloric requirements as a balanced diet increases the probability to cover a bigger diversity of vital vitamins and minerals, particularly important for growing children and mothers (Galhena et al., 2013). Urban agriculture also holds the potential to supplement the income of a household or spend less money on food purchases.

The difficult employment situation of Syrian refugees in Lebanon has resulted in high levels of unemployment due to strict restrictions by the government. High levels of poverty are spread among refugee households as refugee families rely on low-paid informal jobs and food aid. They have no choice than reside in poor areas where housing is cheap which at the same time diminishes job and housing opportunities of vulnerable local communities. Home production through urban agriculture can be a viable solution to ameliorate food security for urban poor affected by the Syrian crisis.

Not only does urban agriculture hold the potential to feed mouths of impoverished city dweller but at the same time it can contribute to recycle material to build planting containers, reduce and transform organic waste into fertilizer and to cut down emissions caused by the transportation of agricultural goods. Due to lack of authority action, insufficient waste management and high pollution levels are both critical issues in Lebanon posing serious health risks to the popu-

lation. Another advantage of UA is that the use of pesticides can be directly controlled by the producing households as in Lebanon there are no policies in place that restrict the use of pesticides for agricultural products that are not dedicated to the export market. This has resulted in heavy pesticide overuse among farmers holding adverse health risk for consumers.

Promoting and supporting refugees and vulnerable host communities to set up their own urban gardens can be one approach to achieve sustainable livelihoods and an increased food security. Reviewing literature has shown that there have been a multitude of micro-garden projects carried out for refugees to enhance their food security, however, these cases almost exclusively refer to refugee camps. Gardening for refugees in urban settings has shown to lack comprehensive research resulting in the role and potential of UA for refugees and their adversely affected host communities being unclear.

While the practice of UA as a strategy to improve the food security of urban poor is increasingly reported, UA has not yet received the support by authorities to be responsive to these issues. Adequate policies and legal frameworks are lacking or completely absent which is also the case in Lebanon (Tohme-Tawk et al., n.d.).

Refugee populations residing in slums and poor urban areas struggling with food insecurity is a widespread phenomenon resulting from conflicts all over the world. Currently 124 million people in 51 countries suffer from “crisis food insecurity”, an increase by 55% compared to 2015 and the unprecedented number of 68 million forcibly displaced people around the world give proof to the pressing need to tackle food insecurity with efficient action (UNHCR, 2018; FSNI, 2018). In this context, it should be referred to the *Sustainable Development Goal 2 (SDG 2)*, which is to: *End hunger, achieve food security and improved nutrition and promote sustainable agriculture* (UN, 2015). One of the eight targets to monitor progress towards this goal is 2.1 ensure food for all: “By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round.” (UN, 2015).

Subsequently, efforts of the international community and governments of affected nations or hosting affected nations must be directed towards ensuring that all people whose food security is threatened by living in protracted crises and war are not left behind. This study seeks to expand the dialogue on such vulnerable communities that are currently under-served and to explore pathways that alleviate their living conditions which is vital to achieve SDG 2 and eradicate hunger.

By displaying the lessons learned from the urban gardening project knowledge is built on how to improve the performance of similar projects in the future. Such knowledge can serve to initiate or support existing relief action as it provides insights of the suitability of UA for multiple objectives and highlights potential challenges and risks.

The contribution of this research shall benefit the civic society, non-profits, international organizations and relevant government authorities to develop strategies to solve urban food insecurity of vulnerable refugees and their host communities based on urban gardening approaches.

1.5 Structure of the Study

This study is organized in six chapters. Chapter 1 comprises an overview of the thesis. A brief introduction is followed by the problem statement, research objectives, research questions and the justification of the study are presented.

Chapter 2 provides background information relevant to the study and a brief introduction to the urban agriculture project on which this thesis is based.

Chapter 3 consists of a compilation of relevant literature in regard to the concept of food security, and the state of the art on the impact of urban agriculture for food security and economic resilience. In Chapter 4 the research design and methodology are presented with details on the sampling method, data collection and data analysis procedures. Chapters 5 presents the survey results followed by a discussion of the findings in relation to sighted literature. Chapters 6 is a summary of the key findings and recommendations that derive from the overall findings of the study.

2 Background Information

2.1 Refugees

This study refers to the term *refugee* as a person who “*has been forced to flee his or her country because of persecution, war, or violence and has a well-founded fear of persecution for reasons of race, religion, [...] or membership in a particular social group.*” (UNHCR, 2016b)². Over the course of this study it will only be referred to refugees that have crossed international borders.

UNHCR outlines the rights of refugees and the legal obligations of States to protect them. One of its core principle is that a refugee should not be send back to a country where he or she faces severe threats to their life or freedom. This is considered as a rule of customary international law. UNHCR declares itself as ‘guardian’ of the Convention and its Protocol of 1967. According to the legislation, States are expected to cooperate with the UNHCR in ensuring that the rights of refugees are respected and protected (UNHCR, 2017b).

After World War II the newly established United Nations High Commissioner for Refugees (UNHCR) had 400.000 registered refugees. This number was rapidly outdated as civil wars accelerated after the Cold War and major refugee incidents took place, as the mass flight of Kurds from northern Iraq, refugees fleeing from interethnic violence in Yugoslavia and more than 2 million Rwandans fleeing their country in 1994 (IFPRI, 2014b). In 2016, 22 million people worldwide were considered as refugees and 10 million people were stateless or at the risk of statelessness (UNHCR, 2016; UNHCR, 2016b). Almost a quarter of all refugees are Palestinians as a result from the partition of the Palestinian territory in 1947 among Arabs and Jews by the UN General Assembly (IFPRI, 2014b). In 2016 more than half of all refugees came from mainly only three countries: Syria, South Sudan and Afghanistan (UNHCR, 2016b).

Most forced migrants are hosted in developing countries and 70% of the world’s refugee’s population are already in exile for more than five years (IFPRI, 2014). The contribution of developed countries mainly consists of the allocation of humanitarian aid as a policy response. Such aid is directed either to the country of origin to resolve the causes of migration or to the hosting countries as a mean of burden sharing (Morel 2009; IFPRI, 2014b).

2.1.1 Syrian Civil War Crisis

One of the most severe refugee crisis of our current time was ignited in 2011 by the outbreak of the Syrian civil war. The ongoing fights have caused massive refugee flows to its neighboring countries (IFPRI, 2014b). UNHCR (2018) estimates that up to half a million people lost their lives, while 6,6 million Syrians are IDPs and a further 5,6 million have fled to Turkey, Lebanon, Jordan, Iraq, Egypt and Europe (UNHCR, 2018). There are also some countries who are far from the region but have signed the Refugee Convention and voluntarily took small numbers of Syrian refugees as Venezuela or Australia. Noticeably absent from the countries having absorbed Syrian refugees but located close by are the Gulf States which are not signatories to the 1951 Refugee Convention. However, these countries have provided funding for humanitarian relief action in the region.

Of the nearby countries that allowed refugees to enter, Turkey, who is a signatory of the Convention, hosts almost half of all fled refugees. In many cases governments struggle with keeping trace of exact numbers, as many refugees enter illegally and are thus not registered. In Jordan, for example, the estimated numbers vary between 600.00 to 1,3 million Syrians (UNHCR, 2016). In relative numbers, the biggest burden fell on Syria’s neighboring country Lebanon which in 2016 had the highest nationals to refugees’ ratio in the world, with one refugee per four citizens (Kabalan, 2016). In Jordan, in contrast, this number is much smaller with around 1 refugee per 16 citizens. Neither Jordan nor Lebanon do adhere to the Refugee Convention while

² The Refugee Convention of 1951 is a key legal document that builds the basis for UNHCRs work. The Convention was ratified by 145 States and provides a definition of ‘refugee’.

Turkey maintains a geographical limitation to the Convention which means that the country only allows people from Europe to seek asylum.

Although the governments of these countries do allow UNHCR and International Aid Organization to register the refugees on their territory, the provided protection that comes with the registration is very limited. It does to some extent enable access to services but the refugees can not seek asylum nor obtain legal residency or refugee status (Mohsen, 2016).

2.1.2 Refugees in Urban Areas

The term refugee often evokes a picture of crowded, tented settlements and camps which nowadays does no longer reflect the true refugee story. As urbanization globally moves forward, it is observed that refugees are increasingly moving to towns and big cities (Pavanello et al., 2010; Reardon, 2016). In fact, more than 50% of all refugees reside in urban areas while only one third refugees live in camps (UNHCR, 2014).

Refugee camps versus integration into the urban population have in the recent years become a highly controversial subject with pros and cons for the refugees, host communities and international aid communities. Critics claim that camps impose limitations on the rights and freedoms of refugees, disable people to make meaningful choices about their lives and doom them into a less dignified lifestyle with low development opportunities.

It has shown that refugees moving into towns and big cities often seek economic independence, a sense of community and sometimes even safety (Pavanello et al., 2010). Achieving complete self-reliance outside of camps might still be very difficult for refugees as they often face limiting regulations or other constraints as discrimination when trying to access the local labor market of the host country. Humanitarian assistance might thus still be necessary to prevent households from slipping into conditions of severe deprivation.

However, when providing humanitarian assistance to the refugees in urban areas difficulties other than those in camps may arise. Ferris (2013) has determined several concerns that impede humanitarian assistance in urban areas. Some of the most critical problems are presented as follows: Firstly, it is hard to direct and monitor support and assistance to poor urban populations as they tend to be more mobile and move more often within and between cities. Secondly, initiating programs in urban settings calls for more administrative efforts as actors in urban areas are more diverse, which means that more authorities with different responsibilities and mandates must be consulted, engaged and addressed to carry out humanitarian work. Thirdly, distinguishing refugees or displaced populations from the pre-residing urban poor might be difficult. In some cities, such a distinction is not always possible as 'host' communities may themselves be displaced or refugees from other crisis. To address the latter, Ferris advocates a re-examination of the concept of host communities, particularly the interaction between displaced persons and the communities in which they live.

In fact, evidence suggests that refugees residing outside of camps can positively contribute to the host community's economy when they are supported in achieving self-reliance in a way that is adapted to local conditions and markets. Further, camp alternatives have also shown to have more potential for lasting positive impacts on the host communities, as they facilitate synergies with national development planning while the creation of parallel structures is avoided.

UNHCR and other international agencies are aware of these changes and have started to adapt their policies towards new strategies to respond to this new reality (Culbertson et al., 2016). While UNHCR issued in 1997 an explicit anti-urban policy, claiming that "life in urban areas does not constitute an answer to a refugee's problems and may well be significantly more difficult than in a rural settlement" (Halas, 2016) there has been a gradual shift in its policies the last decade starting in 2009. Back then, operational guidelines were released in the "policy on refugee protection and solutions in urban areas" was followed and enforced in 2014 by UNHCR's "policy on alternatives to camps" that promotes to assist refugees to become self-reliant in cities and rural areas. In view of the accelerating pace of urbanization it is likely that future humanitarian operations will increasingly be carried out in cities

2.1.3 Food Security and Refugees in Urban Areas

The increasing numbers of refugees in urban areas comes with great challenges for urban food systems. IPFRI (n.d.) argues, that if in such cases refugee streams are not coordinated and supported, refugees could increase instability among the local urban population. One of the major expected negative consequences is the threat that refugees could adversely affect the food and nutrition security of their host communities (Mabiso et al., 2014; UNHCR, n.d.b, UN-Habitat & IFI, 2015). It is also not uncommon that refugees themselves struggle with severe food insecurity upon arrival, which is likely to be exacerbated if urban food systems of host countries are underdeveloped. Reardon (2016) reports that the food security situation for some Syrian refugees has become so dire that they saw no other option than returning to active war zones in Syria, seeking better food and shelter conditions. According to UNHCR (2014), up to 85% of the 5,6 million Syrian refugees reside outside of refugee camps, mostly in cities and towns. This comes with enormous pressure on these urban areas. While more extensive data exist on the food security status of refugees in camps or tented settlements, those living outside of camps, either rural or urban, are often underreported. The following examples are sought to reflect the variety of food related struggles refugees might encounter in urban environments.

The Forced Migration and Refugee Studies Program (FMRS, 2007) of the American University of Cairo conducted a survey on food intake and food acquisition of South Sudanese refugees living in Cairo. It showed that refugees were almost completely excluded from formal support mechanism (subsidies on staple foods) and from informal support mechanism (informal networks/sharing communities) to obtain food. Further, almost three fourth reported to be charged higher prices at local markets or having been verbally abused, insulted and become victims of stone-throwing. The FMRS concludes, that such incidents increase anxiety and make people avoid markets with negative consequences for their diets.

A research by Abollahi et al. (2008) evaluated the food security status of Afghan refugees in Pakdasht, Iran. They found that 88% of the surveyed population were food insecure, caused mainly by unemployment and low socioeconomic status. Other negative findings were, that more than half of the women were found to be overweight or obese while the prevalence of underweight and wasting of children were remarkable (11.0% and 12.7%, respectively), indicating a recent malnutrition. For the Syrian case, the WFP (2016c) conducted an analysis on 1562 Syrian refugee households in Turkey not living in camps but residing in the provinces of Gaziantep, Hatay, Kilis and Sanliurfa. The results showed that one-third of the surveyed population were food insecure while the remaining 66% were left at a risk of becoming food insecure.

Even though aid assistance is very difficult in urban areas, UNHCR and other aid organizations have taken action to support urban refugees. The primary goal of urban interventions targeting food security of refugees aim to prevent malnutrition, especially among women, young children and other groups with specific needs (UNHCR, n.d.b). In countries where urban markets are functioning, food assistance is mostly provided in the form of cash transfer or vouchers. However, in many cases refugees are hosted in countries that face dire economic conditions and struggle from pre-existing food insecurity among local urban population (Mabiso et al., 2014).

UNHCR (n.d.b) promotes, that whenever possible, refugees should be integrated in national food security programs, further emphasizing the importance of early collaboration of aid agencies with the host government, local municipalities, relevant UN agencies, partners and donors.

2.1.4 Self-Sufficiency for Urban Refugees

History shows that crisis as civil wars can be a long-lasting endeavor, resulting in semi-permanent refuge of the affected population in foreign countries. This implies long-lasting impacts on host communities and their food security. The major aim of long-term food security interventions is to increase the self-reliance of refugees in urban areas by linking efforts with livelihood programs (UNHCR, n.d.c). Being, at least partly, self-sufficient can be vital for refugees and displaced populations as funding for humanitarian assistance often runs lower when a crisis drags on. Supporting refugees to achieve some degree of self-sufficiency reduces costs of aid agencies and opens the way to find long-term solutions to their displacement.

Building a sustainable livelihood, however, usually goes hand in hand with settling permanently and local integration. A common problem that refugees face in this context is, that most host

countries in the Global South are reluctant to allow refugees to settle permanently and implement policies that impede local integration (Jacobsen&Fratzke, 2016). They can often not obtain citizenship, sometimes even after decades of living in a country, which hinders their efforts to live a normal life as they have no or limited access to the labor market, public services and education (Strandberg, n.d.). When access to labor markets are restricted and incomes are low, evidence has shown that urban agriculture can be a vital solution to supplement food supplies with fresh food or create small income opportunities (Gallaher, 2012; Olawepo, 2012; Prain&Dubbeling, 2011)

2.2 Background on the Study Area

2.2.1 Syrian Refugees in Lebanon

Lebanon

Lebanon is a small country at the eastern shore of the Mediterranean Sea, with a pre-crisis population of 4 million people. The Lebanese population itself has a very heterogeneous society composed of a wide range of ethnics and religious groups. The sharing of power between the various religious communities led over the years to rivalries over power, exacerbated by the complex issue of hosting long-term Palestinian refugees³. These discrepancies climaxed 1975 in a 15 year long destructive civil war tearing the country apart and tremendously hampering its development up to recent days. Over the last three decades the country slowly re-established relative socio-economic and political stability, however, hostilities and conflicts among different religious ethnicities are ever-present and many partly destroyed houses and lost infrastructure have not been repaired to the present day. Ongoing inner and outer conflicts with neighboring countries, as with Israel in 2006, pose a continuous threat to the country's fragile stability and economic development. The Syrian crisis which started in 2011, has resulted in a wave of hundreds of thousands of refugees streaming into the country. According to Oxfam (2016) the economic growth of Lebanon went from 8% per year during 2007–2010 down to only 2% in 2012 where it stagnated for the following years and hasn't recovered yet.

Impact of Syrian Refugee Influx

As of January 2018, the Lebanese Government estimated that 1,5 million Syrians reside in Lebanon of which 995.000 are registered⁴ with UNHCR (LHF, 2017). The impacts of the crisis have profoundly affected Lebanon's already vulnerable parts of the society. Prior to the conflict, around 1 million Lebanese lived under the countries poverty line of \$4 per day (World Bank, 2013b) while in 2017 that number has been estimated to have risen by 50% to 1,5 million of which a third are children (LHF, 2017). The immense influx of refugees exacerbated Lebanon's pre-existing problems, mainly poor services delivery, high poverty levels and resource scarcity (Kabalan, 2016). Consequences are increasing prices for food and housing, public services are collapsing and the competition for jobs has led to a fall of wages with adverse effects on both refugees and the host communities (FAO, 2014).

Health services:

The health facilities of the country are immensely overstretched due to the increased demand for their services (LHF, 2017). The fragmented nature of the Lebanese healthcare system which is currently run by various actors as international NGOs, charities, religious organizations and public entities result in great confusion where to seek medical assistance among refugees. Even if the health care infrastructure would be improved, refugees would only have very limited access to health care. This goes back to a newly introduced policy in 2014 to which around 70% of the refugees residing in Lebanon lost their legal status in the country.

³ More than 10% of Lebanon's population constitutes of long-term Palestinians refugees that fled from violence and eviction after the partition of the Palestinian territory in 1947 among Arabs and Jews.

⁴ Reasons for not being registered range from fearing negative consequences in the future when having their names in official records or because people lack proper information or access to the registration points (Berti, 2015).

The Norwegian Refugee Council (NRC), operating in Lebanon, estimates that 65% of the refugees avoid seeking health assistance when needed as they are afraid to be evicted not having valid residence permits while another 55% can not afford the costs of a treatment (NRC, 2014). The efforts of international organizations to overcome these issues are progressing only slowly as they have to coordinate all their actions with the minister of health and are not authorized to open their own field hospitals (DMI, 2017). Among the host population 18% are in need for better health assistance (FAO, 2015). Under the current situation mortality and morbidity rates are expected to keep rising (LHF, 2017).

Education System:

The protracted nature of the crisis has also overstrained the Lebanese education system. Despite the announced ambitions of world leaders in 2016 to get all Syrian refugees children into school, many needs are still not met (LHF, 2017). Besides notable efforts by the Ministry of Education and Higher Education, around half of the refugee children in school age have never stepped into a school or have already missed many years. This will have tremendous long-term effects on their lives as it decreases the likelihood to obtain higher education, leaving them with limited and rather low-paid work opportunities in the future.

Obstacles includes lack of sufficient classroom space, lack of staff and cost of transportation to schools with few solutions in sight as money is insufficient to undertake needed measures. According to the NRC, additionally many children suffer from posttraumatic stress conditions. This makes their integration in a foreign school system even more difficult (NRC, 2017). The International Rescue Committee (IRC)(2017) has come up with a strategy plan until 2020 that foresees to launch early childhood education services to help refugee children succeed in Lebanese public schools and to initiate new investments to improve program effectiveness.

Another important aspect of the problem is that parents face financial constraints which brings them to the dilemma to decide if they send their children to school or to work in order to secure food for all family members (IRC, 2017). As long as such basic needs are not met, the percentage of children not visiting school will not decrease in the near future.

Labour Market:

Trying to make ends meet the refugee populations has streamed on Lebanon's formal and informal labor market to generate income. It has become a controversial topic if this has led to more unemployment among Lebanese as no reliable data on pre-crisis unemployment rates are available to proof this widespread claim. Contra arguments are, that Syrians mainly picked up jobs that Lebanese were already very reluctant to do. However, what can be said is that refugees are often preferred in low-income and non-qualification jobs as they accept lower wages.

FAO (2015a) predicts that as a consequence of the labor rivalry in rural areas over low paid jobs, parts of the rural Lebanese community choose to relocate and move to urban areas to find new jobs. Due to a growing discontent within the Lebanese population the Ministry of Labor decided in December 2014 to withdraw all refugee work permits, except for the sectors of agriculture, cleaning and construction. These three sectors are dominated by labor shortages as there is a mismatch of income expectations and skills of the Lebanese work force (Errighi & Griesse, 2016). In 2015, an even stricter regulation has been released which made refugees sign a pledge to not work, however, this regulation has later been withdrawn again. Until now the Lebanese government continues to keep up the limitations for refugees to access the work market and it is estimated that more than 90% of the economically active Syrians (56% of men and 7,6% of women aged 15-64) operate in the informal sector (ILO, 2014; VASyR, 2017).

Housing:

Another problem is the housing condition of refugees. Since the outbreak of the war, Syrian families have settled within more than 1700 Lebanese host communities in urban and rural areas as there were no official camps build up for them (NCA, 2015). Around 15.000 refugees were hosted directly by Lebanese families which exemplifies the hospitality typical for the region and the pre-war amicable relationship between the nations of the two countries which, however, has greatly suffered over the last six years as tensions grew. The reason of the government for not allowing UNHCR to set up camps can be tracked back to its experience with Palestinian refugees. Most these Palestinians, nowadays in their second or third generation, still reside in refu-

gee camps throughout Lebanon that have become their permanent homes⁵. Fearing a replication of this incident has mirrored the decisions that have been taken by the Lebanese authorities in view of the Syrian refugee crisis. Consequently, increased competition and conflicts over affordable housing with the host communities have been reported (UNHABITAT & UNHCR, 2014). No efforts have been made yet by local authorities to regulate the situation. The Lebanese government has consistently emphasized that Lebanon is not an asylum country and even though the prolonged stay of refugees is tolerated, a repatriation or resettlement to another country is desired (Zetter&Ruaudel, 2016).

Food Security of Syrians and their Host Communities

Out of the 1,5 million Syrians residing in Lebanon, 650.000 receive food assistance by the WFP in 2017 (WFP, 2017c). However, a high dependence on food assistance, limited access to income and an overall decline in the amount of food assistance provided due to the need to reallocate money to other emerging food emergencies in the world all contributes to a continuing unstable and low food security status of Syrian families in Lebanon (WFP, 2016a). Pre-existing food insecurity among the host community is expected to have worsened as a consequence of the crisis.

Food Assistance in Lebanon:

For the first 5 years of the crisis the WFP provided assistance through an electronic food voucher system that allowed beneficiaries to purchase food with an E-card in one of the WFP's 450 partner shops for US\$ 27 per household member per month. In late 2016 an updated card system was introduced for 170.000 Syrians that allowed more freedom as either cash could be redeemed from any ATM of the country to purchase food or the E-card could be used as usual to buy food in a partner shop. In the same year the WFP further launched a monthly multipurpose cash transfer package that, for the first time, did not only target food needs. The package consisted of the usual US\$ 27 per person per month and a top up of US\$ 175 per month per household to meet other needs. The latter program was rapidly expanded and reached 133.000 recipients at the end of 2016.

By 2017 650.000 Syrian refugees were supported by the WFP through one of the introduced programs. Since the start of the program in 2012 a total of US \$1 billion food aid has been injected into the Lebanese economy (WFP, 2017c). Another milestone by the end of 2016 was that for the first time food voucher E-cards were also provided to around 52,000 vulnerable Lebanese, which was done in cooperation with Lebanon's Ministry of Social Affairs.

While these numbers seem promising at the first glance, a more detailed examination of the situation gives much cause for worries.

Sate of Food Security Among Refugees:

The Vulnerability Assessment of Syrian Refugees in Lebanon (VASyR) showed that in 2017 91% of the refugee population residing in the country is food insecure to some degree, a slight decrease by 2% compared to 2016. In 2013, however, the number of all food insecure households was by 25 percent points lower.

While those households being "mildly food" insecure remained relatively stable over the years, varying between 53%-65% from 2013 to 2017, the data on (previously) "food secure" and "moderate and severe food insecure" households reveal that the situation has continuously worsened. The number of households being food secure dropped from 32% in 2013 to only 9% four years later. At the same time the number of moderate and severe food insecure households drastically increased in the last 4 years by 26% to a total of total of 38% in 2017.

The unsatisfying rate of food secure Syrian households in Lebanon in 2017 is determined by the circumstance, that high percentages of households have unacceptable food consumption scores (FCS). The FSC, applied by VASyR, takes into consideration the dietary diversity, the frequen-

⁵ They are still largely excluded from the Lebanese society, public services as schools and from participating in the labor force. Thus, they often completely depend on aid from NGO's and the United Nations Reliefs and Works Agency for Palestinians (UNRWA)(UNRWA, 2015).

cy of consumption and the nutrient value of consumed food groups over a recall period of seven days. Based on this score, households are classified into three categories: poor, borderline and acceptable food consumption.

In 2017, 11% of Syrian households had a poor and 27,1% a borderline food consumption (VASyR, 2017). Both values deteriorated by 3%, respectively, compared to the previous year. A notable difference exists between the percentage of female-headed households with inadequate food consumption and male-headed households (50%vs34%). The daily dietary diversity of households, has been constantly decreasing for the last four years, which raises concerns of large-scale micronutrient deficiencies. The number of households eating a diet of low diversity⁶ went from 4% in 2015 to 20% in 2017 while the percentage of households with a high dietary diversity dropped from 46% in 2015 down to 18% in 2017 (VASyR, 2017). The number meals consumed serves as a proxy for food quantity. For this indicator, more positive results have been reported. The number of consumed meals by adults per day (2,01) and children under 5 (2,41) increased in 2017, whereas in the years prior to 2016 these values have been steadily fallen (1,8 and 2,3 in 2016). Regarding the nutrient content of consumed foods, it showed that the consumption of nutrient-rich healthy food groups, including vegetables, dairy products and eggs, also kept declining in 2017.

By 2017 a total of 1.395.000 Syrian refugees are estimated to be in need for food aid while currently only 650.000 are assisted (FScluster, 2017).

Sate of Food Security Among Host Communities:

Around 52.000 Lebanese receive food aid since 2017, however, it is estimated that more than 580.000 vulnerable Lebanese are in need for food assistance. (FScluster, 2017). Lack of reliable up to date data on the magnitude of food insecurity among the host population, caused and exacerbated by the refugee influx, leaves their situation mostly in the dark. Pre-war estimations range around a food insecurity rate of 15%-20% while 9% were classified as deprived and 41% as poor (IFI, 2014). While the prevalence of food insecurity is significantly lower within the host population, poverty pockets do exist and negative coping strategies are also adapted by nationals (WFP, 2017b).

Syrian Refugees in Lebanon's Urban Areas

The national population of Lebanon is to 87% urbanized (UN-Habitat, 2017) and according to a jointly report of UN HABITAT and UNHCR (2014), most Syrians reside in urban settings and peri-urban areas. At least 30% live in one of the countries four largest cities: Beirut, Saida, Sour and Tripoli (UN-Habitat, 2017).

A reason could be the restrictions imposed by the Lebanese government on refugees in 2015. The refugees receive curfews and work permits for only three sectors (services, construction and agriculture) (ILO, 2016), which resulted in more refugees moving to urban areas pursuing to find a niche in the informal economy (ILO, 2016).

According to the International Labour Organization (ILO), Syrian refugees seeking work often find some kind of job within 3 months, in 78% of all cases through either Syrian or Lebanese acquaintances (ILO, 2016).

Aid Assistance to Syrian Refugees in Urban Areas:

A study conducted by UN-Habitat (2016) showed that only 18% of the Syrian refugees in Lebanon live in so-called informal tented settlements found in the countryside. This number clearly indicates that humanitarian aid programs focusing only on supporting refugees in camps will not be sufficient in this crisis.

According to Culbertson et al. (2016) the services provided to urban Syrian refugees were hampered from the beginning by strategies that were based on the experience of aid assistance undertaken in camps, rural areas or failed states, rather than tailored to low- to middle-income populations in urban areas, as the case in Lebanon. The result was an unsustainable use of funds

⁶ Referring to a daily dietary diversity (VASyR, 2017). Low=<4,5 food groups; medium=4,5-6,4 food groups; high=>=6,5 food groups;

Food groups are: Cereals; Vegetables; Fruits; Meat; Eggs; Fish; Pulses/legumes/nuts; Dairy; Oils/fats; Sugar/honey

in the long run, as expensive parallel structures were established with lacking investments in building capacities of the host-countries' institutions. Improvements came with the first Lebanese Crisis Response Plan (LCPR) in 2015. The LCPR brought together priorities of the Lebanese government to support host communities with those of the international aid agencies to support refugees.

However, there are no clear guidelines how the LCPR strategies are to be translated into roles, responsibilities, and budgeted programming (Culbertson et al., 2016). Further, conflicting viewpoints, goals, and priorities among different UN agencies, among international NGOs and local NGOs and great differences between the government's and the UN's system, have all caused inefficient outcomes.

Moreover, Aline Rahbany from World Vision International emphasizes special attention must be drawn in this conflict to drivers of social cohesion to prevent tensions amongst host communities and refugees. Refugees who do not possess stable financial backing and can only rely on low paid jobs and are forced to reside where rent is very cheap. In an urban context, this foremost applies to impoverished areas. As these areas are also home to deprived Lebanese families and low-paid workers from other countries, increased competition and conflicts over affordable housing are the consequence with much potential for tension. (World Vision, 2016).

2.2.2 Urban Agriculture in Lebanon

Institutional Context

Peri-urban agriculture in Beirut was practiced since the 18th century (Lteif & Soulard, 2015). Back then mainly in the form of fruit and olive trees around the city walls. In 1980 a debate on increasing the sustainability of the city picked up the subject of urban gardening and the State envisioned to implement some forms of protection to the existing surrounding peri-urban gardens. However, laws and regulations did not turn out to deploy any protectionism, which led to a sharp decline of peri-urban agriculture as urbanization and land tenure, with all the related power relations and implications, took their toll on them (Lteif & Soulard, 2015). Data on urban agriculture in Beirut is extremely scarce, however, in cases where it is practiced it is mostly done on residual spaces and comprises the cultivation of strawberries and open field cultivation of parsley, mint, thyme and lettuce. (Tohme-Tawk, 2004).

There are no suitable policies and strategies concerning existing urban agricultural lands and other urban fertile areas. The lack of policies and an institutional framework is owed to a lack of recognition from planners and policy-makers (Tohme-Tawk et al., n.d.). A problem that applies for the whole region, according to Nasr and Padilla (2004), as research, extension, resources, enabling policies and strategies for urban agriculture are almost non-existent.

Environmental Context

The climate at the coast areas of Lebanon, where also the project area of this study is located, is Mediterranean and characterized by hot and dry summers over 30 degrees and mild, rainy winters in December and January. Lebanon receives 8600 million m³ of precipitation per year (Meteoblue, n.d.). The greatest share of water withdrawal comes from groundwater (53,4%) while only 0,2% of Lebanon wastewater is recycled (MoE, 2012). The countries annual water demand ranges from around 1470 to 1530 million m³ with 61% used for agriculture, 18% for domestic use and 11% for industrial use (MoE, 2012).

In theory, the availability of water exceeds the usage. However, due to the countries inability of efficient water storage, high water pollution and misuse in agriculture and domestic use, rapidly increasing pressure is put on the countries water resources (IFI, 2014). Climate change and exploding population growth, caused by the influx of Syrian refugees, places further strain on water resources. In Beirut, official water authorities constitute the main supplier of domestic water but pipe systems are leaking and poorly maintained. Being home for a third of the countries citizens, the capital and its surrounding suburbs are highly overpopulated with great deficiencies in meeting the water demands of the population. In summer, severe water shortages between July and October are common. To stretch the scarce water supplies, piped water is rationed and sometimes only running three hours per day (UNDP, 2011). Therefore, many

households have roof-top tanks installed that are filled by private tankers to supplement their domestic water needs. These tankers source the water from around 20000 illegal wells around Beirut, which contributes to depleting the cities underground water reserves (World Bank, 2014; Korfali, 2007).

Urban Agriculture Project in Bourj Hammoud

In view of the prevalence of dire conditions faced by refugees in Lebanon but also among host communities the Environmental and Sustainability Unit (ESDU) of the American University of Beirut (AUB), the Near East Foundation and the Young Women's Christian Association (YMCA) initiated an urban agriculture project as a measure to provide relief for both refugee and host populations.

The project, on which this study is based on, was carried out in the areas of Nabaa, Dawra and Bourj Hammoud, all three belonging to the municipality Bourj Hammoud, a district of Lebanon's capital Beirut. The objective of the project was to improve the food security and economic resilience of both Syrian refugees and their vulnerable Lebanese host communities through improving their food availability by enabling them to produce a part of their food themselves on their balconies and rooftops and/or to sell the produce. The project implementation period started in September 2015 and lasted until December 2016. The project was designed in a way that was sought to enable participants to independently continue with their gardens after the implementation phase.

Bourj Hammoud has a very heterogeneous population and is home for many low-income workers from North and East Africa, Iraq, Sub-Sahara Africa and South-East Asia, but also to deprived Lebanese. Rent is affordable and still available and there are various low-paid and low-skill job opportunities in factories, garages or nearby construction sites (Madoré, 2016). The district was selected as project area by the project initiators as it is highly populated by Syrian refugees. In 2016 it was estimated that of its 120.000-150.000 inhabitants, on a surface of only 2,5 km², one fifth were Syrians (Madoré, 2016). The project planned to target a total of 150 households, both vulnerable Syrians and Lebanese, while the share of Syrian participants was should prevail. In a first step, A criteria list was developed to choose participants, which including inter alia water availability, having a balcony/rooftop and the level of sun exposure and wind protection (all criteria in Annex C) to facilitate the selection of beneficiaries and to guarantee suitable gardening conditions (ESDU, 2015). Next, ESDU, NEF and YMCA reached out to the municipality administration and local Community-based Organizations (CBO's) operating in Bourj Hammoud to obtain lists and addresses of possible participants.

Assessment visits of households followed during which participants were selected and invited to the garden training workshops. During these visits, it showed that Syrian families often lived in small rooms with no balconies which was one of the main reasons why the total number of participating households resulted in being smaller than initially intended (ESDU, 2015).

In a next step, the technical project team developed different gardening kits, a horizontal planting kit, a vertical planting kit, a composting kit and a sun-dryer. These kits were adapted to the study area, as balconies usually don't surpass a width of 1 meter.

The horizontal kits consist of plastic crates that can be used on balconies or rooftops with the possibility to install trellises for climbing plants as tomatoes. The shape and structure of crates allows for good drainage for optimal root conditions. The kit can easily be added on by beneficiaries, as plastic crates are left beside streets and other public spaces which at the same time serves to reduce and recycle waste of the urban areas. The vertical kits were made of wooden frames that holds up to 40 plastic bottles of 2L volume and is especially useful for balconies that do provide much space for cultivation. The bottles are cut at one end and arranged below each other in rows, which grants water economy as only the upper bottles must be irrigated. The result is a dripping water cascade to the lower bottles. Surplus water can be collected from the last row of bottles and re-used for the plants. The plastic bottles are mostly suitable for herbs, spices and leafy vegetables while the crates suit crops with bigger volumetric measures and roots as carrots, pumpkins or beets. Further, a composting unit, made of a crate, was developed to convert the households organic waste into fertilizer. The horizontal and vertical kits were pre-tested in the backyard of a community center in Beirut. The tested kits turned out to be productive and

supplied the community kitchen with good quality thyme, parsley, pepper, cherry tomato, mint etc. (ESDU, 2015). The previously mentioned sun-dryer was sought to enable participants to efficiently dry herbs and other produce. As this item was more cost-intensive not every household would be able to receive one, therefore it was initially planned that one would be shared among around 20 households and would be installed on one rooftop. In the end the kit was dismissed as entering rooftops of other people's houses was expected to possibly cause discrepancies. A detailed description on the characteristics, technical data and crop suitability of all the different gardening is provided in Annex C.

To build capacities among participants, workshop sessions were held that comprised a theoretical and a practical part. During these workshops the participants were informed how to maintain a garden, how to produce organic fertilizer and pest controls but also a hand-on session how to plant the different kits and how to raise their own seedlings so that they could continue with their gardens independently after the implementation period. The first workshop took place in December 2015 while the number of attendants was lower than presumed, even though many more households were invited (ESDU, 2016a). Expected reasons were, that meanwhile Syrian families had moved to another area or even left the country (ESDU, 2016a). During this kickoff workshop four participants were selected to test the horizontal and vertical plastic kits along with two other kits (PVC pipes and burlap) starting end of January 2016. The other workshop participants did not yet receive a planting kit. During the test phase, more households were visited and selected. After a test phase of around 3 months, the originally selected and pre-tested plastic kits proofed to be the most efficient ones. Starting end of May 2016, the participating households received their planting package consisting of soil, starter seeds/seedlings, fertilizer and a gardening kit. Each kit was delivered and installed by the project engineers. Which kit was given to which household was dependent on the available space and architecture of the building. New households were continuously added and the last installation of kits took place end of November 2016. In the end a total of 73 households were equipped⁷. In Annex C an overview of the different delivery periods and number of households can be obtained.

Further, the project also integrated a community based approach. Four highly motivated participants were selected and received intense training sessions on planting, irrigation, composting, pest control and prevention and fertilizer usage. Their task was to serve as vocal points for the beneficiaries by supporting them with their extensive gardening expertise to achieve better results but also to monitor their progress⁸. For this activity, the trainers received financial compensation, however, only until the end of the project period. It was intended that the trainers would find pleasure in their work and to build good relationships with their households so that they would continue their task on a voluntary base. The role of the trainers in following-up with the families was crucial for the sustainability of the gardening activity, especially for families that were added to the project in November 2016, around the time when the project implementation ended.

⁷ Some more households were selected but dropped out, the gardening kits they were sought to receive were additionally distributed to other households that already had kits.

⁸ Each trainer received an equal share of households they were responsible for, which were a little less than 20 households each. Every of their household was to be visited at least twice a month which sums up to several household's visits per week for each trainer.

3 State of the Art and Theoretical Framework

The aim of this literature review was to collect available evidence on the impact of urban agriculture on poor households in low and middle-income countries. The major interest of this study is to investigate if and how urban agriculture can positively contribute to food security and enhance economic resilience of vulnerable population groups in cities, mainly refugees and members of their host communities. This chapter is structured in accordance to the research framework of the study which will be presented in detail in the methodology chapter.

Three main subjects are presented in the following chapter that serve to provide extensive background information and to contextualize knowledge on various fields that are of relevance for this study.

The first section will give a short introduction the concept of Food Security with its various dimensions and implications.

In the second section the concept of Urban Agriculture (UA) will be introduced. Subsequently, findings of studies that have examined the impact of UA on food security are presented, including yield potentials, increased dietary diversity, increased caloric availability, nutrient importance of home-grown food stuffs and role of women in urban agriculture. The second part to this section deals with the results of studies that aimed to capture the economic relevance of UA for low-income households in developing countries, as earning potentials among various countries and likelihood to reduce food expenditures. The section is concluded by showcasing several of micro-gardening projects for refugees to gain insight into potentials and challenges.

In the third section of this chapter a framework on urban agriculture and food security is presented which built the base for the development of the research design of this study. The framework comprises and supports the theories and evidence drawn from previous findings of this chapter regarding positive contributions of urban gardening for food security and economic resilience for vulnerable refugee and host communities.

3.1 Food Security

The incident of food scarcity with symptoms from physical and psychological discomfort up to mortality has been a part of the human experience ever since. In our current age 795 million people globally are considered food insecure and undernourished (FAO, 2015b).

The concept of food security emerged from the world food crisis that took place in 1972 to 1974. The crisis resulted in reduced global grain supplies which caused international grain prices to double and posed a serious threat of the food supply for importing nations (FAO, 2015c). Evoked by the crisis, the first World Food Conference took place in 1974. The focus of the conference was to ensure sufficient supply but also to increase stability over time of supply which is in direct conjunction with production, storage and trade.

In the following decade, a shift of attention took place towards the access of food, which was then determined to be another key factor of food security (FAO, 2015c). Decision makers realized, that sufficient production alone is not leading automatically to food security. Being capable to acquire the needed food is at least of equal importance. This understanding brought attention to policies that deal with addressing incomes and food expenditures.

Since the 1990 a fourth component joined the discussion, food utilization. This fourth pillar captures the necessity of sufficient energy and nutrient intake by a human's body, which is linked to food preparation, a diverse diet and intra-household distribution of food (FAO, 2008a). While in the early stages of the new food security concept the focus lay on food quantity, nowadays the aspect of food quality, implying a balanced and nutritious diet, is globally gaining recognition and importance

3.1.1 Four Pillars of Food Security

Food security is defined to exist when “all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for

an active and healthy life” (FAO, 1996). Attached to the definition that people are food secure if they have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life, are the four pillars of food security: The physical availability of food, economic and physical access to food, food utilization and the stability of these three dimensions over time. Food availability is linked to the supply side of food security and is determined by the level of food production, stock levels and net trade.

Food access refers to an adequate supply of food at the national and international level. However, this does not itself guarantee household level food security. Based on this knowledge a greater policy focus has been laid on incomes, expenditure, markets and prices to fight insufficient food access.

The utilization of food refers to an individuals’ body’s ability to absorb the most of available nutrients of a consumed food. Sufficient energy and nutrient intake is linked to good care and feeding practices, food preparation, diversity of a diet and intra-household food distribution.

The fourth dimension is the stability over time of these three dimensions. People might still be food insecure if they have access during most months of the year, but not all months, or if they are very vulnerable to shocks or crisis (FAO, 2008b). An overview of indicators for each dimension is illustrated in Figure 1.

The WFP has declared food insecurity to be stemming from six key factors: the poverty trap, lack of investment in agriculture, climate and weather, war and displacement, unstable markets/prices and food wastage. Each factor is sought to hamper at least one of the four key aspects of availability, access, stability or utilization to some degree (WFP, 2013).

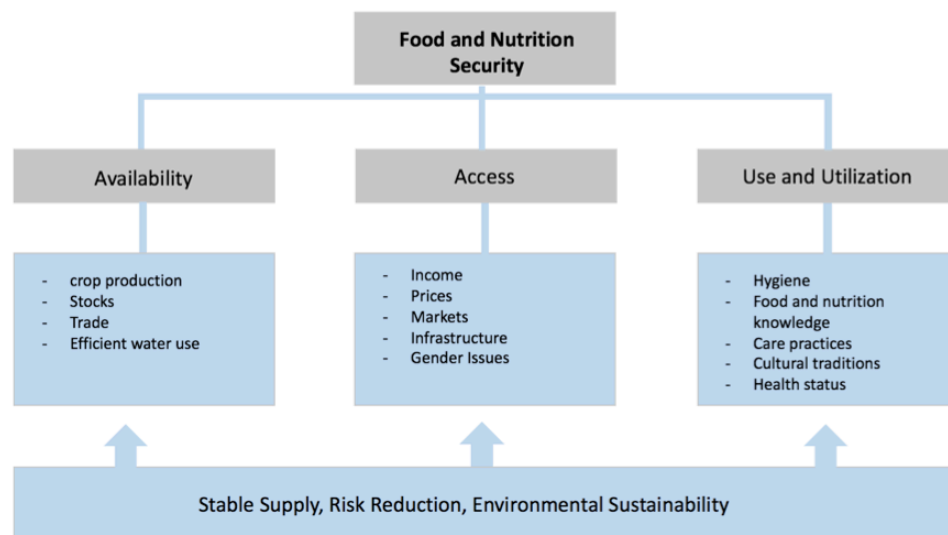


Figure 1: Dimensions of Food and Nutrition Security. Source: FAO, 2016

The food availability in Lebanon is relatively safe as there is a sufficient availability of food for its population, secured mainly by food imports (Bankmed, 2016). However, the economic access to food is hampered as food prices all over the country are very high and a key problem for both local host population and refugees. FAO (2015) reports that the food prices have been continuously increasing over the last years while the quality being offered is rather poor. It is estimated that before the crisis, low-income Lebanese families, foremost those living in deprived peri-urban and rural areas, spend around one third of their income on food, making them more sensitive to fluctuations in food prices or food shortages (IFI, 2014).

FAO and the WFP state, that a combination of several factors as protracted economic vulnerability, less income opportunities or lack of money to buy food, caused mildly food insecure households to fall into moderate food insecurity and households that were moderate food insecure fell into severe food insecurity in 2016 (FSCluster, 2017).

3.1.2 Duration and Severity of Food Insecurity

Two indicators that determine the food insecurity of an individual are the duration and the severity of lack in food. Both indicators have different impacts on a person's life. To start with the timely dimension, the duration, there are in general two categories: chronic lack of food or transitory lack of food. Thus, food insecurity can either be a temporary, short-term experience or a persistent and sometimes even a lifelong condition. Table 1 provides an overview of the triggers, origins and approaches to overcome chronic and transitory food insecurity. A third category, less often mentioned, is the intermediate food insecurity. It is seasonal and occurs in a cyclical pattern of inadequate food intake, as for example food shortages in the pre-harvest periods (FAO, 2015c).

Besides the timely dimension, food insecurity also can also be differentiated into different levels of severity. Food (in)security can be experienced at different levels. The stages can range from mild food insecure to severely food insecure.

To obtain this information it has been widely adopted is to directly ask people about their experience of food insecurity. This is frequently done among several countries for national monitoring purposes with a survey tool (FAO, n.d.). In order to have an indicator for the previously mentioned SDG Goal 2, target 2.1: “[...] *end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round.*”⁹”, FAO adopted the approach of measuring food insecurity through people's experiences by developing and validating a global version of the surveyed tool for internal use (FAO, n.d.). The result was the the Food Insecurity Experience Scale Survey Module (FIES-SM). This survey module is a metric of severity of food insecurity at either household or individual level. Respondents are asked eight question to which they either reply yes/no. All questions refer to their access to adequate food. Each question is related to a different experience and is associated with a different level of severity of food insecurity (FAO, n.d.). When the quantity of food consumed decreases as for example portion sizes are cut or people run completely out of food, the severity stage of food insecurity increases.

	<i>CHRONIC FOOD INSECURITY</i>	<i>TRANSITORY FOOD INSECURITY</i>
<i>Occurs when...</i>	people are unable to meet their minimum food requirements over a sustained period of time	sudden drop in the ability to produce or access enough food to maintain a good nutritional status
<i>Results from...</i>	extended periods of poverty, lack of assets, inadequate access to productive or financial resources	short-term shocks and fluctuations in food availability and food access (year-to-year variations in food production, food prices volatility, changes in household incomes)
<i>Can be overcome with ...</i>	long term development addressing poverty, as access to education or credit more direct access to food to enable to raise productive capacity	planning and programming difficult as often unpredictable and suddenly emerging requires different capacities and types of intervention, including early warning capacity and safety net programs

Table 1: Types of different duration of food insecurity. Source: FAO, 2008b

3.2 Urban Agriculture

Urban agriculture (UA) can be summed up as the cultivation of plants and the raising of live-stock in cities (intra-urban) or around cities (peri-urban). UA has historically derived from the so-called allotment gardens in Europe. The lack of efficient transportation and food preservation techniques in the time led to the incident that rural populations, which had migrated to cities from rural areas, started to grow food near to their homes. The purpose was to ensure a nutrition and economic safety net against unemployment and to supplement low incomes (Matos&Batista, 2013). In the United States and Canada, urban gardening, introduced by European immigrants, was increasingly practiced during crisis as the great depression (“Urban Relief

⁹ UN, 2015

Gardens”) and both World Wars (“Victory Gardens”) and later reappeared as an outcome of the growing environmental and social justice movement against consumerism, conformity, unemployment and inflation in the 1960 and 1970s (Mok et al. 2014). The type of farms found in UA and PUA range from household gardens over cooperative farms to large-scale enterprises, mostly outdoors but in developed countries, with an increasing share of urban indoor farming for commercial purposes (RUAF, 2016; Opitz et al., 2015; Bosschaert, 2008).

The types of food produced by UA include crops (grains, root crops, vegetables, mushrooms, fruits), animals (poultry, rabbits, goats, sheep, cattle, pigs, etc.), non-food products (e.g. aromatic and medicinal herbs, ornamental plants, tree products), small-scale aquaculture, trees for fruit and fuelwood production, medicinal crops (five-leaved chaste tree or lagundi) and ornamental crops (flowering types and turf grasses) (FAO, 2016c; Bareja, 2010). What is grown where depends largely on climatic conditions, input availability, available space but also on urban policies and regulations. The technology levels of UA practiced in developing countries are mostly low-cost, applying simple technologies (Opitz et al., 2015) while in developed countries the invention and application of high-tech solutions for upscaling of production and city-adopted resource-efficiency are gaining ground. Examples are hydroponics, aeroponics, soil-less farming, artificial light, light transmission techniques into buildings or smartphone (Allard, 2017; Harper, 2016; CFS, 2016, LaMonica, 2014).

On a household level, if not practiced for pleasure or recreation, UA serves in first line for self-provisioning with food and selling surpluses (Lee-Smith, 1994; Mougeot, 2005; Armstrong, 2010; Meenar & Hoover, 2012; Cohen et al. 2012)

3.2.1 Urban Agriculture for Food Security

In the recent developments, UA has become more and more an issue of interest for science and politics as an instrument to alleviate food insecurity at the level of the household and community. The contribution of UA to food security of urban dwellers has been subject to many research papers.

The UN High Level Task Force on the Global Food Crisis (HLTF) (2008) names UA as an important strategy to alleviate urban food insecurity and to build urban food systems more resilient to crises. Further, UA can be instrumental to achieve some of the United Nations Sustainable Development Goals (SDG), namely SDG 2 (End hunger, achieve food security and improved nutrition and promote sustainable agriculture), SDG 11 (Make cities inclusive, resilient, safe and sustainable) and SDG 12 (Ensure sustainable consumption and production patterns). By enabling urban dwellers to produce their own food they can, in a best-case scenario, alleviate hunger (targets SDG2), increase their food security and nutrient intake with higher quality, more safe home-grown food with a lower environmental food print (targets SDG2/SDG12). Further, urban societies can become more resilient to price fluctuations as they not solely depend on food purchases (targets SDG11).

The most likely positive contributions of UA to food security found in literature are the provision of an increased access to fresh and nutrient-dense food, greater caloric availability, greater dietary diversity and the provision of income (Zezza & Tasciotti, 2008; Ruel, 2006, Korth et al, 2014). UA can also serve to increase the stability of household food consumption during seasonality or other temporary food shortages, as it contributes to self-reliance (Mougeot, 1994; Egal et al., 2001; FAO, 2016c). Whereby each of these listed factors (greater availability, increased access, stable supply) are necessary, they are not necessarily sufficient to achieve food security which demonstrates once more the complexity of the food security concept. Once (more) food is accessed, the utilization may for example be limited by disease or inadequate care practices. Thus, there is a multitude of correlations that must be considered to ensure food security.

Even though UA is receiving renewed interest, there is no official source that provides comprehensive statistics of the true extent and impact of UA but data are scattered and often rather based on estimations. This can be attributed to the difficulties that arise when trying to measure the impact of UA. Seemingly straightforward statistics as the amount of food grown is in fact very challenging to quantify and aggregate. It, however, starts with the difficulty on data how many people in the world practice UA.

Zezza&Tasciotti (2010) brought together comparable, nationally representative data from household surveys and multivariate analysis from FAO between 1998 and 2005 on agricultural practices at the household level in urban and rural environments. The data entailed 15 developing or transition countries across 4 continents to quantify and elaborate the magnitude of urban agriculture for the urban poor. The results show that households practicing UA vary from 11% in Indonesia up to 70% in Vietnam. However, in 11 out of 15 countries the share of households participating in UA is over 30%.

Increased Availability of Food and Calories through UA

Armar-Kelemsu (2000) states that studies who measure the impact of urban agriculture on food security tend to support the hypothesis that urban agriculture improves the food security of vulnerable households. And in fact, several studies were found concluding based on their data that UA has positive impacts on food security for those practicing farming compared to non-farming households in urban areas.

A study conducted by Gallaher (2012) in the slums of Kibera, Nairobi, looking at the effects of sack gardening's where 88% of the farmers perceived in a follow-up survey that their gardens provided them with extra food. The same was the case for a study by the RUAF foundation from March 2010 to May 2011 together with the World Bank (Prain&Dubbeling, 2011) conducted 4 case studies in Lima, Accra, Nairobi and Bangalore, looking at the role of UA for sustainable poverty alleviation. Inter alia, a focus groups discussions was undertaken, where producers stated to gain clear benefits from their UA activity as for example access to extra food. In Lima, 73,2 % urban farmers with UA as main occupation stated that their gardens provided them with extra food while the percentage was almost equal for households where UA is not the main occupation (73,8%). In Bangalore, in contrast, the percentage went down to 36%. The mean among all four cities showed to be 64%.

Increased Availability of Food:

Mwangi (1995) conducted a cross-sectional study on UA in impoverished areas of Nairobi and showed that surveyed farming households were slightly better off in terms of energy and protein consumption than non-farming households. A third group, farmers who participated in an UA support program of an NGO, were significantly better off in energy and protein consumption than the two other groups. However, it must be mentioned that the required daily food intake (calories) for all three groups were still not met. More positive findings were that children of farmers were less stunted, wasted or severely malnourished. No multivariate analysis was presented.

Similar results were published by Maxwell et al. (1998) in a multivariate analysis on UA in Kampala, Uganda, a study frequently cited in many other papers as evidence of the positive impact of UA. The researchers found that urban agriculture has a positive impact on children under 5 as the prevalence of stunting and being underweight was significantly lower among children in farming households, particularly in the lowest socioeconomic status groups.

Yeudall et al. (2007) carried out a cross-sectional study almost 10 years later in the same area, Kampala. The aim of the study was to elaborate the links among different urban agricultural activities, household food security, dietary intake and anthropometric and biochemical indicators on the nutritional status of children aged 2-5 years. The food security questionnaire was based on questions used in Maxwell's et al. (1998) study and from the most recent Uganda Demographic and Health Survey while dietary diversity was measured by a 24-hour food intake recall.

As expected by the researchers¹⁰, the results showed that UA contributed to a significant greater availability of kilocalories (kcal) from own produce for the children of livestock and crop farming households than non-farming households. Children from families that did not raise livestock had a significantly lower average dietary diversity score than children from families that raised livestock. However, there was no significant difference in household food security scores among farming and non-farming households. Instead it was observed that household assets di-

¹⁰ Referring to calories specifically deriving from own produce, not the overall caloric intake. However, this most likely contributes to an overall higher intake of calories.

rectly contributed to food security and to the weight-for-age score of children, but indirectly to nutritional security indicators as consumption of animal-source food and dietary diversity. Land available for agriculture and the educational level of the primary caregiver also contributed directly to food security and indirectly to the other nutrition indicators.

These results were coherent with a study conducted three years earlier by Berti et al. (2004), who evaluated the impact of agriculture through reviewing reports that described 30 agriculture interventions that measured impact on nutritional status. While in fact most agriculture interventions did contribute to an increased food production, this did not necessarily improve nutrition or health within participating households.

These overall mixed findings correspond with the findings of Zezza&Tasciotti (2010), whose study was mentioned at the beginning. They not only measured the dissemination of UA but also its impact. In regard to the importance of UA they come to ambivalent results. On the one hand, UA should not be overemphasized in its role to alleviate food insecurity and poverty as overall agricultural production is often quite limited in urban areas but on the other hand they suggest, that its role should also not easily be dismissed, particularly in Africa and those countries where agriculture provides a notable share of income.

Yield Potential of Urban Agriculture:

The concept of having adequate food consumption on the household level refers to both qualitative terms as variety or safety but also to quantitative terms as caloric sufficiency. Hereby the potential of yields of UA plays an important role, too. In cases presented in the previous section, it was shown, that UA could increase the food that is available to farmers, however, the amount seemingly was in many cases not enough to reach food security.

Yields depend, inter alia, on factors as technologies used, climate conditions, availability of land/surface, quantity and reliability of water sources, seed quality but also farmer's skills and knowledge (Brown&Jameton, 2000; Armar-Klimesu, 2015). Nugent (2000) argues, that UA in practiced in developing countries is often falsely perceived to have in general rather low yields as a result from poor-quality inputs, low levels of technology and high losses from a variety of sources but according to him this should not be taken as a fact. Several scholars agree that urban plots do have potential for high yields and can be even more productive than rural yields (Nugent, 2000; Royte, 2015; Danso et al., 2002; FAO, 2016c). FAO (2016c) even argues that urban gardens can surpass rural production 15 times. Reasons for UA having high yield potentials are that plots are smaller and problems can be addressed more precisely and faster, there are no wild animals eating the plants, plants can be cultivated more densely, soils are nourished more frequently and water and fertilizer can be applied more efficient and effective (Royte, 2015). Different examples on the scales of UA yields have been found in literature that encourage the projection of high yielding city gardens. In Havana around 90.000 habitants practice UA. In 2012, they yielded 63.000 tons of vegetables, 20.000 tons of fruits, 10.000 tons of roots and tubers, 10.5 million litres of cow, buffalo and goat milk and 1700 tons of meat (FAO, 2015d). In the city Dakar, Senegal, 70% of all vegetables consumed in the year 2000 were produced on urban- and peri-urban farms (Mbaye & Moustier, 2000) and in Accra, Ghana, even 90% of vegetables consumed in 1994 were produced by farmers within the city (Cencosad, 1994). In Dar es Salamm, Tanzania, more than 90% of all leafy vegetables found on urban markets had been grown in surrounding open spaces and home gardens in 2000 (Dongus, 2000) and in Shanghai, China, 90% of milk and eggs originated from urban and peri-urban areas (Nugent, 2000).

In terms of household level yield potential, Brown and Jameton (2000) advocate, that a 10mx10m plot can provide the yearly vegetable need of a household and cover a big share of its vitamin A, B and C and iron needs. In the early 90's in Nairobi and Dar es Salaam urban farming households managed to produce a quarter of their food requirements in their own gardens (Mwangi, 1995; Sawio, 1993). Bowyer-Bower and Drakakis-Smith (1996) found in their study that in Harare, Zimbabwe, 25% of the low-income respondents managed to cover two thirds of their food consumption with own produce.

Turning to more recent data, FAO (2016c) promotes that UA can provide 20kg of food a year or in other terms 1m² can provide either around 200 tomatoes (30 kg) per year, 36 heads of lettuce every 60 days or 10 cabbages every 90 days or 100 onions every 120 days (FAO, 2010).

While these findings support the assumption that UA can achieve notable yields, jumping to conclusions is eluded as most of these studies were conducted in the 90s and early 2000' whereas current data are very scarce. As cities and urban environments have undergone vast changes in the last two decades due to increased globalization, technology, urban population growth and other factors, the conditions in which these farming activities have been undertaken might have tremendously changed. Thus, currently the only up-to date data base is provided by FAO, deemed as a reliable source.

Increased Intake of Fruits and Vegetables and, Increased Dietary Diversity

While the previous section focused more on food security scores and increased caloric availability from grown crops and raised livestock, this section will present findings on the contribution of UA on an increased/more frequent fruit and vegetable consumption and a higher dietary diversity. In this literature review these two topics have been treated separately, as the UA project in Bourj Hammoud only grew fruits and vegetables and thus studies examining the potential of UA to increase access to fruits and vegetables were of specific interest. Increased dietary diversity, in contrast, can include consuming fruits and vegetables but the variety within fruit and vegetable groups also play a role, whereas increased dietary diversity can also derive from animal products of the urban garden or from buying a greater variety of food types with income generated by selling home-grown fruits and vegetables.

Nutrient deficiencies are frequently observed among food insecure households. Important for public health and most often deficient among households affected by food insecurity are the vitamins A and C, calcium, magnesium, iron, iodine¹¹, folate and zinc (Kirkpatrick et al., 2015; Ke&Ford-Jones, 2015). Iron and folate deficiency both cause anemia, while iron deficiency stands out as most severe among children and women in chronic food insecure households (Ghose et al, 2016). It impairs learning, leads to low productivity in school-age children and can cause maternal depressive disorders. Magnesium and calcium are both important minerals for bone health. Vitamin A deficiency is the leading cause of preventable blindness in children and increases the risk of disease and death from severe infections. For pregnant women, it may increase the risk of maternal mortality (WHO, 2018). Vitamin C is best known for its importance for a well-functioning immune system and in the growth and repair of tissue. Zinc deficiency in children may cause growth impediments and increased risk of infection as it also important for the immune system.

Increased fruit and vegetable consumption are important for health, as they are rich sources of vitamins, minerals, dietary fibers and provide other beneficial non-nutrient substances as plant sterols, flavonoids and antioxidants which all contribute to prevent NCD's (WHO, 2018).

Increased Intake of Fruits and Vegetables:

A study in Cagayan de Oro in the Southern Philippines showed that urban farmers had the highest share of daily vegetable consumption (85%) compared to higher-socio economic classes (64%) (Potutan et al., 2012). However, the authors added the important information that in the study area vegetables were doomed as "poor man's food" by higher-class locals, as they are widely available and grow in many farm plots, backyards and school gardens in the urban areas of Cagayan de Oro. Wealthier classes instead consume more meat and fish. Meat in moderation and fish also contribute to several very important nutrients as iron or omega 3 fatty acids. Which of the two social groups in the end consumed the healthier diet can in this case not simply be assumed. However, this does not undermine the circumstance that through UA fruits and vegetables were made easily accessible to the poorer population of Cagayan de Oro.

In Addis Ababa, cooperative farming households consumed 10% more vegetables per year than the annual average of non- involved households of similar income (Egziabher, 1994). Korth et al. (2014) conducted a peer review to analyze available evidence on the relation of urban agriculture and food security in low and middle-income countries. In the studies that were reviewed by the scholar a positive correlation between UA and increased vegetable and fruit consumption was identified, yet again, that was in no case positively or directly linked to improved levels of

¹¹ Iodine will not be considered in the further analysis as the major sources are seafood and salt and thus not related to crops of the UA project. Source: www.health.govt.nz

nutrition. They sum up their findings stating that the impact of UA on food security and nutrition is in their opinion unanswered. Taylor and Lovell (2014) argue, that research on measuring the impact of UA on fruit and vegetable intake is sparse, as a result of the informal and private nature of this type of gardening.

Increased Dietary Diversity:

While the presented studies have shown that fruit and vegetable accessibility and consumption can increase through UA (Potutuan et al., 2012; Korth et al, 2014; Egziabher, 1994), others scholars have focused their research on evaluating in how far dietary diversity can increase through UA. Dietary diversity is defined as the number of foods or food groups households consume over a certain period. Consuming a more diverse diet, and especially a variety of fruits and vegetables, helps to ensure an adequate intake of many of the essential nutrients needed by the human body (WHO, 2018).

The previously mentioned study by Gallaher (2012) in the Kibera Slums of Nairobi, also looked at the overall dietary diversity and diversity of vegetable consumption. There was no significant difference found among farming and non-farming households in overall dietary diversity. The authors justify these findings by stating that sack gardens produce mostly dark green leafy vegetables, a food group that is eaten daily by most households of the study area. Those farmers who could generate money from selling their produce bought more of already consumed food groups, as for example maize flour, instead of entering a new food group as meat or fish.

The results of individual food categories showed, however, that farmers significantly more frequently consumed green leafy vegetables than non-farmers and marginally significantly more frequently fruits. In turn, non-farmers consumed significantly more seafood. Summing this up, the results showed that farmers consumed a significantly greater diversity of vegetables than non-farmers. A follow up survey also revealed that 87% of farmers said their sack gardening helped them save money to purchase other food types.

The previously mentioned study by the RUAF foundation/ World Bank (Prain&Dubbeling) in 2011 did not only carry out a focus group discussion but also a 24-hour food intake recall. The resulting data found no significant differences between the nutritional status of producers and non-producers except of the case in Bangalore. There was a difference between very poor farmers and non-farmers, leading to the assumption of the researchers that practicing UA enabled the very poor to diversify their diet. Further, significant differences in levels of consumption of some food groups were found, especially leafy vegetables and orange-fleshed vegetables with higher consumption rates by farmers.

In Harare, Zimbabwe, urban farming households were evaluated as being more nutritious breakfasts, however, farming households usually had only 2 meals while non-farming households of the same wealth class had mostly 3 meals per day (Chaipa&King, 1997). A possible explanation provided by the authors is, that the farmers cultivate peri-urban and are spending their days on the field. Thus, they do not come back for lunch, instead combining breakfast and lunch. In this study farming households also consumed protein rich foods for more months during the year than non-farming households, resulting in a greater dietary diversity for a longer period over the year than non-farmers. Children of farmers also had a higher growth rate in terms of height and weight compared to children of non-farming households, which leads the authors to the assumption of a significant relationship between urban agriculture and growth rate of children.

These studies have shown that urban households that are involved in some sort of gardening are more likely to consume a greater variety within a food group, consume a food group more frequently or over a longer period of the year, mainly always the fruit or vegetable food group, but not always consume a greater overall dietary diversity (number of food groups) than non-farming households. Summing this section up, many published articles, studies, reports and papers on the impact of UA in developing countries were sighted for this review, however, many tend to prematurely report on a positive relationship between positive nutritional outcomes and UA but there are rather few studies that have created reliable facts to underpin their assumptions.

Impact of UA on Women and Implications on Household's Food Security

The empowerment of women can be crucial to alleviate hunger, malnutrition and enhance food security of households as they attain a critical role in the three pillars of food security (access, availability and utilization). Urban agriculture can serve to enable women to provide food to their families, to generate income and address gender-inequalities with positive effects on the nutrition and food security of their households.

According to FAO (2011) women produce more than 50% of the world's food and make up for around 43% of the agricultural labor force. In regard to urban agriculture, studies provide evidence that women are the key players in this domain. In many developing countries, the prevalence of women among urban farmers can inter alia be explained by the compatibility of the activity with other typical gender-based activities of women as childcare, cooking and cleaning. Urban agriculture constitutes a culturally relevant food source as it enables women to provide food for their families which results in feeling of success and achievement for women in some cultures (Oliver&Heineken, 2017). Slater (2011) indicates that for female farmers of extremely poor areas, urban agriculture can help to increase their dignity by fulfilling their role in society as wives and mothers as UA is perceived as a respectable mean to access food without having to purchase it. In Eldoret, Kenya, female farmers also stated to have increased their self-esteem as urban agriculture enabled them to fulfill their gender role (Simiyu&Foeken 2014). In Nairobi, Freeman (1993) found that women held the opinion that their UA activities positively contribute to their social image as it presents them to society as proactive and diligent homemakers.

Another important aspect of UA is its potential to decrease gender-inequalities in view of access and control over resources within a household. According to the RUAF Foundation (2003) two aspects are mainly of relevance in the context of UA: First, the access to and the control over productive resources (water, inputs, credit, contacts and interpersonal networks et.), while the control of one's own labour and the degree in which one can regulate the actions of others in the household are also highly gendered. Second, the control over the benefits of production, as cash income, food and other products.

Informal economic activities, as UA, have been evaluated as an opportunity for women to regain control over household/productive resources (RUAF, 2003). Apart from control and access to productive resources, studies also have shown positive implications and opportunities for women in regard to the saying over benefits of production. Hovorka (1998) found, that women demanded their share of the household's earnings deriving from UA production. In some cases, it is likely that women might not always succeed to convince their husbands to share the increased cash made available through UA, however, Maxwell (1994) reports that women in such cases secretly retained shares of the money they generated with UA, without knowledge or consent of their husbands.

Thus, UA can at the same time reduce gender-based inequalities within a household and complement women's livelihoods by being an opportunity to generate income. Relating this to food security, it has shown that women allocate up to 10 times more of their income to the well-being of their family, including child care and health, nutrition and education in comparison to men (Duflo, 2012). Subsequently, increasing and facilitating the access of women to income generating activities as UA, can have a direct impact on their household's food security.

Donor agencies, local authorities and NGOs are more and more targeting women with their efforts by increasingly focusing on directing investments towards the empowerment of women to combat food security and inequity between sexes (Akter et al., 2017). The importance of this issue is reflected in the Sustainable Development Goal by the United Nations, as Sustainable Development Goal Number 5 is solely dedicated to advocate gender equality and the empowerment of woman and girls.

3.2.2 Urban agriculture for Economic Resilience

Next to the aspect of holding a potential to contribute to increased food security, UA can also serve to generate income by directly selling produce, by creating employment (e.g. agricultural laborers), by income generating activities as processing and marketing produce (e.g. street food

vendors) and lastly, through producing agricultural inputs (e.g. compost) (FAO&World Bank, 2008; de Zeeuw et al., 2011; Maxwell&Armar-Klemesu, 1999). Different structures and models can be found depending on regions and socio-economic background of the population.

Havana is an exceptional example for employment in UA. Urban farming spread in the city as a response to the trade sanctions that followed the fall of the USSR. In total around 140.000 of the cities inhabitants are directly (80%) or indirectly (20%) engaged in UA jobs providing an income source and livelihood opportunity (Gonzalez Novo & Murphy, 2000).

In the next two sections, a closer look will be drawn to the economic resilience UA can build on the household level, by either generating income through selling agricultural produce or from saving income through lower food expenditures. Gerstl (2001) argues, that a major problem that occurs when studies try to capture economic profitability of UA, is its complexity which might not be apparent on the first sight. Many analyses are based on short time studies, while production costs can vary greatly between seasons and market prices change over the year. Further constraints encountered are unwillingness of farmers to disclose information on their income, seasonality of crops and seasonality of farming activities (Gerstl, 2001). To determine costs and benefits of processes, the exact amount and prices of inputs used and prices obtained for produce must be recorded which is rarely the case if even possible (Veenhuizen & Danso, 2007).

All these difficulties impede reliable data collection and the research and survey data on incomes from UA that are available should not easily be generalized, as farming assets and conditions can vary widely. However, some examples are provided in the following section to illustrate which experiences have been made with income potential of UA.

Generating Income

Literature shows clear evidence, that UA is employed by urban poor in the developing world to supplement their household's income while in some regions it even dominates as first income source (Prain&Dubbeling, 2011, Armar-Klemesu&Maxwell, 1999, Olawepo, 2012; Cabi, 2017). The previously mentioned study by the RUAF foundation (Prain&Dubbeling, 2011) revealed, that in three of the four case study cities urban farming received the highest percentage scores (32% in Accra, 34% in Bangalore, and 34% in Nairobi) when asking for the most important income source among the surveyed population, even though their farming activity was often not their main occupation.

Mugeot (1999) found, that in Lomé, Togo, the monthly income of an urban farmer was equal to around ten minimum wages and in Dar es Salaam, Tanzania, incomes from UA were larger than regular salaries for almost 70% of the surveyed population

Gerstl (2001) looked at incomes gained by households practicing an open-space vegetable production in Ouagadougou, Burkina Faso. A direct and an indirect estimated average monthly from UA was surveyed among farmers. The directly estimated average monthly income was obtained by summing up the incomes estimated by the interviewees from all activities during the current season whereas the indirectly estimated average monthly income was calculated by multiplying the market prices for the different vegetables with amounts produced by farmers (based on farmer's estimations). It turned out, that in all cases (3 different sites) all home garden households underestimated their monthly incomes as the indirect income was always higher than the direct estimated income. They earned between US \$14 (direct estimation) and US \$24 (indirect estimation) per month during the fertile rainy season, which is about the same value as the monthly GNP per capita (US \$20) of Burkina Faso, one of the lowest in the world. In the dry season this was significant less and led farmers usually turned to other activities.

Danso et al (2002) undertook a cost and return analysis in urban vegetable gardens in Kumasi, Ghana, which revealed that irrigated urban vegetable farming reaches an annual income of US\$400 to US\$800. In the case of Ghana this is 2-3 times the income of an average rural farmer. In West Africa, urban farmers have been found to apply various economic strategies for UA. Short-cycle crops were grown to ensure returns on inputs and salaries whereas long-cycle crops had the purpose to maximize benefits and invest in infrastructure, or private or family life (Veenhuizen & Danso, 2007). The yearly profits ranged from US \$20 to US \$700, depending on garden size and garden management. In contrast, women only focused on producing short-cycle crops for consumption and vending as they were not able to afford long-term investments. In-

stead, they got a more regular income with a harvest twice a month and higher returns with a total annual benefit of US\$170 to US\$200. Prain&Dubelling (2011) concluded in their study, that net income of small-scale irrigated peri-urban open space vegetable production in African cities ranges between US\$ 30-70 per month and can go up to US \$200 or more which exceeds official minimum salaries of the countries studied by the factor 1,6 to 10. Veenhuizen & Danso (2007) arrived at similar numbers by conducting a literature review on the profitability of UA in developing countries. They further compared their findings to each countries GNI, an overview can be found in Annex D. FAO (2010) estimates that income from micro-gardens can generate 15\$-30\$ a month per 10m².

Maxwell&Armar-Klemesu (1999), in contrast, presents much lower numbers, claiming that with few exceptions income from UA is not more than US \$20-\$30 per year.

In Lusaka, the urban agriculture hub of Zambia, a survey on 100 urban farmers conducted in 2004 showed, that 65% reported that UA contributes less than 25% to their household income, 22% of the farmers said it contributes between 25%-50%, and 10% reported a contribution between 50%-75% while only 3% indicated a contribution of over 75% (Hampwaye et al., 2004). The researcher sum up, that while in only a limited number of cases UA is the major source of income, for a significant number of people it is however a key measure to diversify their income as part of a multi-livelihood approach.

Thus, depending on external input factors as weather, natural resources, available space, and internal factors as labor insensitivity, strategies, time invested and motivation, the output (harvestable produce) of UA to generate income and create livelihood opportunities differs widely among households and countries. These various examples have, however, provided evidence that UA holds the potential to serve as complementing or primary source for urban farmers in developing countries. Veenhuizen & Danso (2007) advocate that profitability increases when urban farmers focus on products that are high in demand and have a comparative advantage over rural production such as perishable products (e.g. green leafy vegetables and milk), mushrooms, flowers and ornamental plants. Gerstl (2001) draws the conclusion of its research that UA shows to be an income creator for very poor, for low-educated and for few-skilled urban dwellers.

Reduced Expenditures

Another potential economic advantage deriving from urban farming is increased cash availability through decreased expenditures by replacing bought food with home-grown food (Sawio, 1994; FAO, 2016c; Ruggeri et al., 2016; Wilbers, 2003; ILRI, 1999; Nugent, 2000; Veenhuizen&Danso, 2007). A study conducted by Wilbers (2003) revealed, that women that employ farming as their main occupation pursue to reduce their household's expenditures by growing food for self-provision while women who are jobwise involved in another informal urban sector tend to focus more on generating a cash income from their gardens by selling produce. In Ouagadougou, urban farmers were able, during the fertile rainy season, to reduce their rather high expenditures on food by producing their own food (Gerstl, 2001). During dry seasons their (high) expenditures stayed the same and were not positively influenced through their savings they previously attained during the wet season. Accordingly, respondents were at least able to shift a part of their food expenditures for 6 out of 12 months towards other needs as improved health care.

Prain&Dubelling (2011) found in their four case studies, that the percentages of urban farmers who managed to save money from growing their own food were high (Bangalore 56%; Nairobi 70%; Lima 73%; Accra 80%). The saved money was spent on more food and on non-food household needs. All four cities had in common, that mainly staple foods were purchased from those savings. The reason for this was that staples typically only grow in rural areas and could not be produced by the urban farmers themselves. Besides buying staple foods, preferences on how to spend the savings varied between countries and food cultures. In Bangalore and Lima respondents indicated buying supplementary vegetables that they were not able to produce along with sugar while in Accra savings were spend on micro-nutrient and protein rich foods as fish.

During the process of reviewing literature, various examples on how much money can be saved from practicing UA have been found, however, these findings mainly stemmed from UA in

developed countries (Wieneke, 2017; Ishwarbhai, 1991, Algert et al., 2014), while data on developing countries are sparse.

A study by Egziabher (1994) stated that cooperative farmers in Addis Ababa, Ethiopia, consumed 10% more vegetables per year and doing so they saved around 10%-20% of their food expenditures. Another study in Lusaka, Zambia, indicated that lower-income groups spent 77% of their income on food purchases whereas their home garden produce supplied the equivalent of 37% of their income and saved them around 50% of their food expenditures (Lee-Smith, 1994).

In contrast to rural populations, urban populations rely heavily on markets to access their food. Low and very low income households spend as much as 60%-85% of their total income on food and might remain food insecure (Foeken&Mwangi, 2000; Tabatabai 1993; Nugent, 2000; Orsini et al., 2013). Employing UA by households can seemingly in some cases contribute to cut a share of these expanses, throughout the whole year or during certain seasons, and the saved money can be used to buy a greater variety of foods or on other household needs as health, rent, education or clothing.

The overall findings of the previous sections, however, reflect that there is general lack of good quality, reliable and most importantly up-to date data on the potential impact of UA on various dimensions. Cohen & Reynolds (2012) imply that the true impact of UA is still to be explored as existing research is often isolated to a few cities and limited in scope, only assessing a few aspects of UA.

3.2.3 UA Projects for Displaced Populations

Reviewing literature on approaches of employing urban agriculture/micro-gardening for refugees, information on several micro-gardening projects was found. However, only one rooftop garden project for refugees in an urban context was found which reflects the lack of research in this field of study. A brief introduction on these projects and the results will be presented in the upcoming section. Even though gardens in camps are not the focus of this study, the cases will be stated as they are sought to disclose information on encountered challenges and opportunities. This information is, at least partly, expected to potentially be of relevance and importance for similar projects carried out in urban contexts.

The earliest report found on micro-garden projects in refugee camps was from 2004, initiated by Action Against Hunger. Sack garden pilot projects were implemented in two IDP¹² camps in Gulu, Uganda (Radice, 2005). The project aimed to increase livelihood and foods security opportunities through self-consumption of produce or through selling it. The result of weekly monitoring showed, that a bit more than 50% of the gardens were well maintained by the beneficiaries. While all households decided to only use their garden for self-provision, a total of 75% of beneficiaries stated to be interested in trying to sell surpluses if the program was to be expanded. Detailed outcomes on the impact on food security and if there was a nutritional enhancement of vulnerable participants were not disclosed. However, more than 85% of the participants reported to be satisfied with the project outcome and 94% were planning to continue with their micro-gardens.

In 2008 UNHCR (Wtsadik, 2009) started a pilot project of multi-storey gardens (MSG), where produce is planted into the top and side of sacks and in three Ethiopian refugee camps to enhance household food security and micronutrient problems of children under 5 due to a monotonous staple based diets. Fresh food was almost completely absent in the camps being scarce in the region and thus too expensive. Further, the land policies of the government did not allow the refugees to plant crops outside the camps. The most vulnerable households were selected to grow plants and raise poultry for eggs and meat, together with household that showed high motivation. A first evaluation report after around one years (Wtsadik, 2011) showed that people diversified their meals on average three times per week and some households shared vegetables with neighbors. Major challenges were significant water shortages, spillage of water at distribution points, lack of variety of seeds/seedlings and inappropriate seeds used for the sacks. An early monitoring survey showed that in the three different project sites 75%-100% of surveyed

¹² People who are forced to leave their homes but never cross an international border are defined as Internally Displaced Persons (IDPs).

population had started to harvest vegetables and 63%-77% applied recycling water for their gardens as a countermeasure to overcome water shortages. Further results of the survey can be found in Annex A.

UNHCR, WFP and former GTZ (Corbett, 2009) started a similar project 2 years earlier in two refugee camps in Kenya which at that time existed for already 15 years. Acute and chronic malnutrition were widespread. The result report emphasized that green leafy vegetables have been harvested 2-3 times weekly. It was estimated that this has a positive influence on beneficiary's nutrition through increased dietary diversity which in return increased people's appetites and improved their general well-being along with an opportunity of income generation, self-reliance and empowerment of women. Statistic data were not provided. One female participant was cited, stating that: *"I was very concerned as we never had quite enough to eat [...]. I began with five sacks for use in MSG, but I enjoyed it so much I asked GTZ for an additional five sacks which they gave me. [...] I grow enough for everyone in the household to eat, plus I can give a little away to my neighbors. I feel that my family is healthier, we are happier and I do not worry about feeling hungry. [...] If I could double the number of plants I am growing I could sell the excess to neighbors. [...]"* (Corbett, 2009).

Another project, that comes close to the approach of UA for refugees, took place in the Dheisheh refugee camp located in the south of Bethlehem. The camp is home to 15 000 Palestinians on an area of only 0,33 km² (UNRWA, 2012). The camp exists now for 70 years and refugees do no longer live in tents but have built themselves small concrete houses. Surveys conducted by UNRWA showed, that the tight budgets of the households resulted in cutting out the purchase of fresh vegetables to save money for school fees. In 2012, the NGO Karama built 15 rooftop gardens which were maintained by 15 refugee women who lived in the houses they were installed on (Karama, 2013). The objectives were to increase food security and vegetable intake of refugee families, empower women, decrease stress through physical and psychological benefits of gardening and decrease dependence on external aid. The monitoring of the project showed, that the women found ways to expand their gardens through making optimal use of all empty space and they also diversified their produce with time. Regarding the impact of the project, Karma reported that the families' consumption of fresh vegetables has been increased and their limited budgets had been spared. Women reported to have gained self-esteem, experienced relieve of stress and increased life satisfaction through their successful work.

The most recent project combining the idea of gardening and refugees is a pilot project in Lebanon by FAO in rural areas of Lebanon (FAO, 2017). The biggest technical challenges were limited water availability leading to dying plants and loss in interest in the project along with the problem of chicken eating from accessible boxes. The biggest social challenge was lack of commitment of the participants for the project when daily follow-up of irrigation and fertilizer was required and/or when Ramadan started. For some women who lost interest it also turned out that they only joined the project out of peer pressure. Impacts on the food security status of participants have not been disclosed yet. Even though the tented settlements are in rural areas where land is available, the Lebanese government does not allow them to directly cultivate the soil. In this country-specific case the implementation of crate-based micro-gardens is durable solution for planting for vegetables and fruits.

3.3 Urban Agriculture and Food Security Framework

The major positive contributions of UA to food security found in literature are the provision of an increased access to nutritional food, greater caloric availability, greater dietary diversity and the provision of income (Zezza & Tasciotti, 2008; Ruel, 2006, Korth et al, 2014). Korth et al. (2014) have developed a framework that illustrates how these multiple elements can interrelate and in the end, all contribute to increased level of household food security (Figure 2).

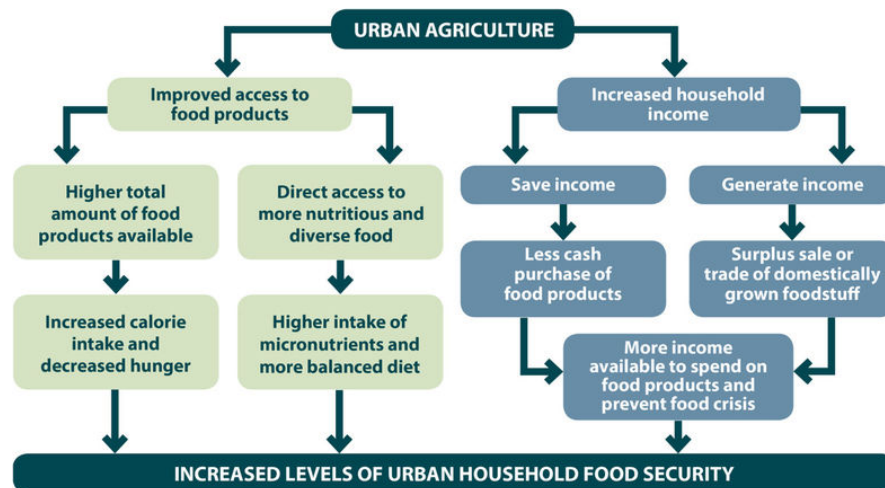


Figure 2: Urban Agriculture's two pathways to increased food security- Source: Korth et al., 2014

A short summary after Korth et al. (2014) of the framework is provided as follows. According to Korth et al. (2014) food security is thought to increase through two main paths: Improved access to food products and increased household income. The former assumes that in total a greater amount of food is available for household consumption as home-grown food adds to the purchased food. This results in higher availability of calories and a lower prevalence for hunger and malnutrition. Fresh produce as fruits, vegetables but also dairy products from animal husbandry or protein rich eggs and flesh advances the nutritional status of household members and positively impacts health. Direct access to a greater variety of fresh foods and complementing staples with fresh food both leads to a more diverse diet richer in vital micronutrients. Household income can be increased through selling produce, either surplus or everything. A second possibly economic advantage is that expenditures are reduced as less money needs to be spent buying fresh produce as it is home grown instead. Both options result in higher cash availability at household level which is considered to be positively related to increased food security, as households can afford greater access to food in quantity and quality. A third component is integrated in the framework, less obvious however, when studying the graph. With “trading domestically grown foodstuff” it is meant that UA can also contribute to other urban dwellers food security, as urban farmers can usually offer their produce cheaper to consumers because long transport costs and intermediaries are cut out. Thus, the buying consumer saves money which he/she could use as well to buy more food. In all three cases, higher cash income of a household is the outcome which is assumed to be positively linked to food security as the quantitative and qualitative access to food of a household has risen. Korth et al. argue, however, that here the “calorie elasticity of income” play a role, which refers to a threshold at which increased income starts to lead to a notable change in calorie intake. Households that have low-income elasticity might not experience improved levels of nutrition linked to an increase in income. Korth et al. (2014) also state that UA creates an ‘opportunity cost’ by either consuming cheaper home produce and thus save money or by increasing income through selling produce.

4 Methodology

In the two previous chapters the relationship between food security and urban agriculture for vulnerable urban communities was contextualized and the urban project, that builds the basis for this research, was introduced. In this chapter, the research process will be outlined. First, the research objectives and subsequent research questions will be stated. Next, the research design and the research methodology will be explained, followed by sampling and data collection methods and which tools and indicators have been used. Lastly, the data analysis process follows and the chapter closes with a summary of the strengths and limitations of the study.

4.1 Research Objective and Research Questions

The research objectives and subsequent research questions guide the study to choose the most appropriate research design and research methodology. An overview is provided in the following Table 2:

Research Objectives	Corresponding Research Question	Research methods applied
I) Evaluate the impact of the project on beneficiary households:	a) Assess the state of food security among the participating household's	<p>[1] What is the prevalence, severity and duration of food insecurity among participant's households?</p> <p>Data sources:</p> <ul style="list-style-type: none"> - Literature review - Six-Item Short Form Food Security Module (integrated into Quantitative-Questionnaire with beneficiaries of UA project) <p>Data Analysis:</p> <ul style="list-style-type: none"> - Descriptive Analysis
	[2] Do the urban gardens increase the availability of food and calories among participant's households?	<p>Data sources:</p> <ul style="list-style-type: none"> - Literature review - Project Monitoring Reports - Quantitative-Questionnaire with beneficiaries of UA project <p>Data Analysis:</p> <ul style="list-style-type: none"> - Descriptive Analysis
	b) Identify effect of project on food and nutrition security of participants' households	<p>[3] Do the urban gardens contribute to increased fruit and vegetable intake and increased dietary diversity among participant's households?</p> <p>Data sources:</p> <ul style="list-style-type: none"> - Literature review - Quantitative-Questionnaire with beneficiaries of UA project <p>Data Analysis:</p> <ul style="list-style-type: none"> - Descriptive Analysis
	[4] What impact does gardening have on female participants? What are possible positive implications from that for the food security of their households?	<p>Data sources:</p> <ul style="list-style-type: none"> - Literature review - Quantitative-Questionnaire with beneficiaries of UA project <p>Data Analysis:</p> <ul style="list-style-type: none"> - Descriptive Analysis

	c) Identify impact of the project on economic resilience of participants' households	[5] Did cash availability of households increase through their urban garden activity? How did the participants spend this extra cash?	Data sources: <ul style="list-style-type: none">- Literature review- Quantitative-Questionnaire with beneficiaries of UA project Data Analysis: <ul style="list-style-type: none">- Descriptive Analysis
II) Determine factors that can improve similar projects in the future		[6] What are the lessons learned from the project?	Data sources: <ul style="list-style-type: none">- Literature review- Project Monitoring Reports- Quantitative-Questionnaire with beneficiaries of UA project Data Analysis: <ul style="list-style-type: none">- Descriptive Analysis

Table 2: Research Objectives, related research questions and research methods applied

4.2 Research Design and Methodology

The study is composed of a literature review complemented by an empirical research. The empirical work is conducted on a case study, an urban agriculture project carried out in Bourj Hammoud, to enhance the food security and economic resilience of Syrians refugees and vulnerable members of its Lebanese host community. The primary aim of this research is to determine the contribution of the UA project on the food security of participants and to display the lessons learned from the project. The research thus first seeks to determine the food security status of beneficiaries six months after the project implementation has ended. This will be done by developing indicators to measure the household food security status of participants. Second, a conceptual framework is developed by modifying the theoretical framework drawn from the literature review. This adapted framework serves to guide the research by constructing a theory on the role of urban agriculture in order to explain and predict its impacts. Thereafter, the contribution of urban agriculture to food security and economic resilience, other benefits, challenges and livelihood outcomes will be determined. This will be done by collecting necessary data through developing a questionnaire that is based on the conceptual framework and the research questions of this study.

For this study, descriptive quantitative research design is deployed, conducted through a survey that was based on a questionnaire.

This research revolves around a case study. A case study is defined as an in-depth study of a group of individuals. In this research, the participants of the urban agriculture project comprise the population of interest. The group is composed of a total of 73 households. Case studies serve to investigate, describe or explain complex units with multiple variables that are potentially important to understand a phenomenon in the everyday real-life situations in which it occurs (Crowe et al., 2011). Case studies can offer insights into existing gaps in its delivery or why a certain implementation strategy to achieve a goal might be more useful over another (Crowe et al., 2011). This fits the context of this research as it is desired to examine and gather information on the selection and design of appropriate urban garden project approaches.

Subsequently, descriptive quantitative research design was chosen as it was deemed to best pursue the two objectives of this research. The first objective is to evaluate the impact of the UA project on the food security of all participating households. The results of a quantitative data collection will provide numerical data which can be statistically analyzed as it is sought to look for a relationship between urban gardening and improvements in food security. Qualitative research, in contrast, would have been a suitable method if a deeper understanding of an individual beneficiaries' motivation or point of view on their gardening experience would have been the

interest of this study. Another advantage of quantitative research lies in its nature of greater objectivity.

A descriptive study reports summary data and seeks to describe the current state of a variable or phenomenon. By doing so it serves to establish associations between different variables. Data collection is mostly observational in nature. Descriptive research aims to finding out "what is," which is based on either observational or survey methods to collect the descriptive data. This is of importance as drawing lessons learned from the project is the second objective of this research. To do so, based on the collected data, it will be looked at what challenges and other benefits have been experienced and resulted from the project which will allow to project on opportunities and risks such UA projects hold.

For this study a face-to-face survey was conducted. A survey is a process of gathering data that can involve a wide variety of data collection methods, inter alia, a questionnaire (Debois, 2016). The chosen instrument to obtain the required data to evaluate the UA project, was a questionnaire that has been developed based on the research questions.

Questionnaires allow to gather information from a large audience, the format of the questions can be chosen and deployed flexible, they enable simpler administration of data, collected data can be analyzed relatively easy and numerous questions about one subject can be asked which allows for extensive data analysis (Debois, 2016; DeFranzo, 2012).

4.2.1 Determination of Food Security Status

The household food security status of participants was measured by a 6-item short form survey module of 18-item Food Security Measurement Module developed by the United States Department of Agriculture (USDA) in 1995. As recognized in the literature review of this study, food insecurity is a complex, multidimensional issue that goes through successive stages of severity as conditions worsen. Each stage consists of characteristic conditions and experiences of food insufficiency, accompanied by related behavioral responses to these conditions by household members (USDA, 2010).

The USDA Food Security Module provides a variety of indicators to capture the various combinations of food conditions, experiences and behaviors that, when taken together, characterize each of the food insecurity stages. The questions of the Module are based on FIES-SM¹³ by FAO which has briefly been introduced in the literature chapter. While the survey module used by FAO allows solely for yes/no answers, the USDA survey module goes more in depth by expanding the answer options. The analysis procedure of both modules results in a score on which the households of respondents are categorized into different stages of food security. However, independent from this overall outcome, the USDA module allows to gain more detailed insights into the frequency of occurrence of each experience which is the reason for choosing the USDA module over the FIES module in this study as these data are of relevance for several analyses over the course of this study and explained more detailed in the upcoming sections of the methodology chapter.

The 18-item module identifies different stages of food security: (1) *food secure*, (2) *food insecure*, (3) *food insecure with hunger – moderate*, (4) *food insecure with hunger-severe*. The transition into a lower stage is evoked by surpassing a threshold, defined by an underlying scale which is pre-set by the USDA. The number of affirmative responses of respondents are added and subsequently compared to the scale. Households are at least a stage (2) if their amount of affirmative coded responses surpass the threshold set for identifiable household food insecurity. Households are at least stage (3) if their amount of affirmative responses surpass the threshold set for identifiable hunger and the most severe stage (4) is reached when the threshold for identifiable severe hunger is surpassed.

Employing the systematic, tested, and validated indicator set that is provided by the 18-item module for food security measurement, or the 6-item short form reduced set, allows to obtain data that are readily interpretable. Due to the scope of this study, the original 18-item long form can not be implemented. The questionnaire of this study, in which the module is embedded, yet

¹³ Food Insecure Experience Scale Survey Module

comprises a multitude of questions that allow to profoundly explore the impacts of the UA project. The short version has been shown to have reasonably high specificity and sensitivity and minimal bias with respect to the 18-item module (Blumberg, et al., 1999). It is designed to reliably capture the first two thresholds: the threshold of identifiable household food insecurity and the threshold of identifiable hunger among household members. However, a major weakness of the 6-item module compared to the 18-item version is, that it does not capture the more severe range of food insecurity where children's hunger and more severe adult hunger occur. The outcome of the 18-item version “food insecure with hunger – severe” is not captured. The short version thus provides limited information in regard to children's hunger: households that obtain the level of “food insecure with hunger - moderate”, the probability that children in the household were hungry during the measured survey period is greater than for other children. In this sense, the measure only provides an indicator of the risk of children's hunger (USDA, 2000).

Even though the module was developed by and is applied in the U.S., various scholars have been applying the 6-item short form survey module to determine food security status of a population of interest in their studies outside the U.S. (Rafiei et al., 2009; Rahim et al., 2011; Daneshzad et al., 2015; Daneshi-Maskooni et al., 2017; Esfandiari et al., 2017).

The questions of the short form food security module can be either designed to capture a period of the last 30 days or to the last 12 months. As data collection fell into the month of Ramadan¹⁴ where food intake is restricted the period of the last 12 months was chosen.

The food security module contains 6 statements and questions (Q) that are displayed below:

(Q1): The food that was bought just didn't last, and (I/we) didn't have money to get more” Was that often, sometimes or never true for you in the last 12 months?

(Q2): “I/we couldn't afford to eat balanced meals.” Was that often, sometimes or never true for you in the last 12 months?” Was that often, sometimes or never true for you in the last 12 months?

(Q3): In the last 12 months, since June last year did you or other adults in your households ever cut the size of your meals or skip meals because there wasn't enough money for food?

(Q3.1): How often did this happen – almost every month, some months but not every month, or in only 1 or 2 months?

(Q4): In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?

(Q5): In the last 12 months, were you every hungry but didn't eat because you couldn't afford enough food?

For Q1 and Q2 the terms “often” and “sometimes” are not pre-defined by USDA, they are left to the discretion of the interviewee. This procedure was adopted in this study to assure compliance with the Guide provided by USDA (USDA, 2000) for analyzing the responses of the survey module which builds the base to categorize the households into food security groups. The term “balanced meal” was explained to the interviewees and is defined as integrating a variety of food groups into the main meals, including fresh produce (vegetables or fruits), staples (rice, bread etc.) but also protein sources as animal products. Throughout the results and discussion chapter of this study the terms “often” will be replaced by “frequently” and the term “sometimes” with “occasionally” to facilitate the flow of reading.

Further, the difference between Q4 and Q5 is that the latter is experienced by a sensation of physical pain that comes from being deprived of food, while the former refers to the perception that one's body would require a greater amount of food intake to reach full potential than it was given at a certain point of time. Eating a smaller portion does not necessarily lead to hunger. This difference has been explicitly explained to the interviewers to ensure a good understanding by the interviewees. According to the responses beneficiaries' households are classified into three different groups (USDA, 2000):

¹⁴ the ninth month of the Muslim year, during which strict fasting is observed from dawn to sunset

Food secure (high or marginal food secure): *Households show no or minimal evidence of food insecurity*

Food insecure without hunger (low food security): *Food insecurity is evident in household members' concerns about adequacy of the household food supply and in adjustments to household food management, including reduced quality of food and increased unusual coping patterns. Little or no reduction in members' food intake is reported.*

Food insecure with hunger - moderate (very low food security): *Food intake for adults in the household has been reduced to an extent that implies that adults have repeatedly experienced the physical sensation of hunger.*

To determine which group applies, a score is created by categorizing the answers into affirmative and negative responses. An affirmative response receives 1 score point. A negative response receives 0 score points. For Q1 and Q2 the terms "Often" and "sometimes" are considered affirmative responses. "Never" is counted as negative response. For Q3 the answer "yes" is an affirmative response while "no" is negative. For Q3.1 "almost every month" and "some months but not every month" are affirmative responses while "only 1 or 2 months" is a negative response. For Q4 and Q5 the answers "yes" are affirmative and the answer "no" is negative. Subsequently the score points are added up.

Based on the score the food security status is assigned as follows:

- Raw score 0-1: **High or Marginal Food Security** (Food Secure)
- Raw score 2-4: **Low Food Security** (Food Insecure without hunger)
- Raw score 5-6: **Very Low Food Security** (Food Insecure with hunger)

The resulting food security scale does not represent the condition of a household member but evaluates the household members as a group. When a stage of food insecurity is reached, this is estimated to affect all household members to some degree, however, not necessarily in the same way (USDA, 2000). Consequently, when the scale measure classifies a household into the more severe range, food insecure with hunger, it indicates that there is at least one member in the household that has experienced hunger as a result of insufficient household resources, but not necessarily all members.

Imputing missing values is of relevance to score and classify households. For imputing missing values the directions of the USDA guide were followed which imply that "yes" is imputed to a missing item if, for that household, there is a valid affirmative response to at least one item more severe than the missing item and no negative response to any item less severe than the missing item (USDA, 2000). Severity hierarchy was determined as follows, starting with the least severe: Q2; Q3; Q3.1; Q4; Q1; Q5.

The conduct the data, the module has been integrated into the questionnaire of this study.

4.2.2 Research Framework

The urban agriculture framework by Korth et al. (2014) provides a comprehensive approach on the contribution of urban agriculture to increased household food security through two different ways: increased household income and improved access to food products. This framework was adapted in this study, to guide analysis on how several dimensions affect urban agriculture and how urban agriculture leads to increased levels of food security and economic resilience for refugee and vulnerable host community households. The modified framework is illustrated the Figure below:

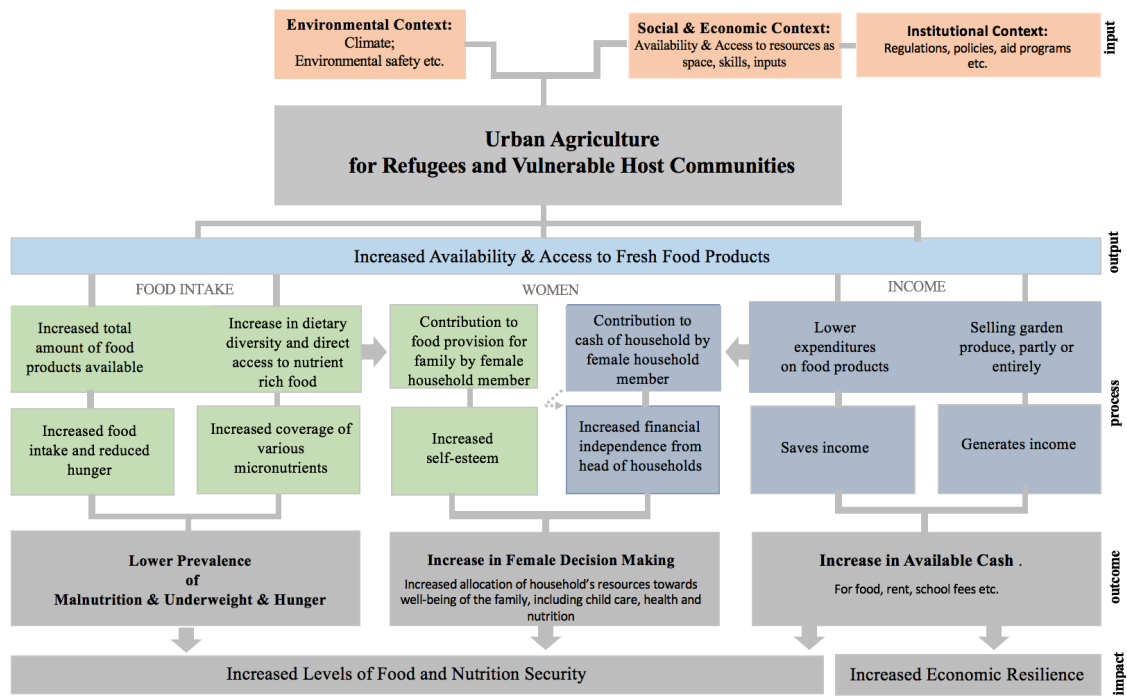


Figure 3: Factors influencing urban agriculture and potential outcomes and impacts of urban agriculture. Adapted after Korth et al, 2014.

The original framework was mainly extended by two components: First, factors that influence urban gardening and thus the potential output. Second, the impact urban agriculture has on women and the possible implications from that on the food security of their households.

In total three factors were identified that influence urban cultivation (livestock or crops). First, the environmental context plays an important role as it determines the suitability of an area for gardening and can limit the kind of produce to be cultivated depending, inter alia, on factors as temperature or water availability. Environmental safety is also crucial, as a heavily polluted environment (soil/air) decreases the quality of produce and even poses health risks through the consumption of contaminated food. A second factor relevant to UA for refugees and host communities is the institutional context. Restricting regulations to gardening activities, as the prohibition to raise livestock (more relevant for peri-urban areas), can limit the scope of action and outputs. On the other hand, institutional support can be crucial for the kickoff of urban gardening as local authorities or aid agencies can provide technical, practical and financial support. The latter greatly influences the social and economic context of UA, which in return directly influences gardening outputs. The social and economic context includes but is not limited to available input resources (soil, fertilizer, water access...), the skills and knowledge of farmers, the perception of agriculture in the society and the available space.

If all the three mentioned factors positively correlate, fresh and good quality fruits and vegetables can be harvested (or dairy, eggs and meat produced).

In regard to food, increased availability and accessibility are assumed to increase the total available food of a household which can increase the food intake and reduce hunger. Further, through producing a variety of fresh food (crops and/or animal products) the overall dietary diversity of a household is expected to go up and the likelihood to meet the daily recommended intake of a variety of important micronutrients increases. As an overall result, the food and nutrition security of the household increases.

In regard to women, the ability to grow food for their families is expected to increase their self-esteem as they contribute to the well-being of their families and might also gain respect from society as they fulfill their role of care-taking. They further can contribute to increased cash of the household by raising revenues through selling produce or through lowering the household's food expenses. This can also boost their self-esteem and increase financial independence from the head of household. Subsequently, women are expected to gain saying in decision making regarding the allocation of the household's resources. According to research this has shown to

be for the benefit of their families, *inter alia* in regard to improved nutrition or intra-household food distribution. As a result, the food and nutrition security of the household increases.

Regarding income, UA can either generate income through selling solely surpluses or even the entire harvest. UA can also lower expenditures which results in saved income. Both actions increase the cash available to the household thus the household's economic resilience. If increased cash is reinvested into food, it further contributes to food and nutrition security of the household.

4.2.3 Questionnaire

The questionnaire of this study serves the purpose to collect data on the impacts of the UA activity and helps to draw lessons learned from the urban gardening project in Bourj Hammoud for Syrian refugees and vulnerable Lebanese communities.

This questionnaire is based on closed-ended questions due to several reasons. As the beneficiaries speak foremost Arabic, the survey mainly holds closed questions as respondents are restricted to a finite number of answers which makes the subsequent data analysis more manageable and the deciphering, coding and translation of a multitude of handwritten Arabic responses is avoided. Further, close ended questions can be given a value or number so that statistical interpretation can be undertaken. They also enable the researcher to collect more specific responses and are thus more likely to communicate similar meanings which is of much greater difficulty with open ended questions. This is of relevance as the survey serves to collect data on satisfaction and challenges encountered by beneficiaries. Pre-set answer options enable to already group certain triggers, which then allows for a more precise identification and prediction of prevalence of causes and effects. Closed-ended questions can be more specific, thus Because open-ended questions allow respondents to use their own words, it is difficult to compare the meanings of the responses. Since the pre-defined responses are straightforward it is more likely that the interviewee answers on sensitive questions. This is of importance as income and household food security status will be inquired, which are very personal subjects. In addition, close ended questions are usually quick to respond to which allows for a greater amount of questions to be integrated into the survey. Different types of closed-questions questions were employed as scale questions (likert-scale), dichotomous questions (mainly yes and no) and multiple choice. If required, the multiple choice questions were supplemented with an open-ended answer option, integrated as "other: _____" which allowed the participants to add answers that might not have been covered by the provided answer choices or to give further explanation to their answer if necessary. In the questionnaire, contingency questions serve to direct different questions to beneficiaries who either used their garden produce for self-provision or for selling, to investigate on respective outcomes. Additionally, a small amount of open-ended questions was added to conduct data on age or income with the aim to obtain more specific answers and no data ranges.

The questionnaire is mainly divided into four sections. The first section starts with questions on general demographical data and general data on their gardens. The questions of the second section accumulate data that allow to make inferences if and how urban gardens impacted household's food security and economic resilience. In the third section, questions cover the satisfaction of beneficiaries with the project, benefits they obtained in their opinion and challenges faced. This part contributes to draw lessons learned from the project. In the last section, the data are inquired on income and state of food security status. These sensitive questions were put last to give the interviewee more time to become comfortable with the interview situation. Table 26 in Annex G provides an overview which survey question addresses which research questions. The final questionnaire is also attached in Annex G.

4.3 Data Collection

To evaluate the potential of the UA project and draw lessons learned, data were conducted through a survey that was based on a questionnaire. In addition to this, background information and complementary data were collected from secondary data sources.

4.3.1 Primary Data

Primary data was collected for this study by using a structured questionnaire. The data collected include socio-economic and demographic characteristics, data on gardening resources and agricultural production activities, food group purchase and consumption patterns, garden income and money savings as a result of own production as well as expenditure additional benefits gained from gardening.

Sampling

The sampling method chosen in this study is purposive sampling. Purposive sampling is a type of non-probability sampling that is most used when a certain cultural domain is studied with knowledgeable experts within (Dolores & Tongco, n.d.). The specific purpose sampling method for the UA project is total population sampling (TPS). TPS is sampling technique where the entire population that shares a certain characteristic is included in the conducted research. It is foremost a suitable technique when the studied population is relatively small (Etikan et al., 2016). The obligatory criteria set is being a beneficiary of the urban agriculture project and to have practiced gardening for at least one gardening season (3 months). As drawn from the project reports, there have been a total of 73 households that had a gardening kit installed on their balconies and rooftops during the project period.

Data Collection

Data collection was conducted through a survey based on the questionnaire that has been developed for this study. More details on the survey can be obtained in the section 4.3.2. *Questionnaire* and the full survey in English is attached in Annex H.

The survey was first prepared in English and afterwards translated by local native speakers into the classical Arabic “Fusha”. Fusha is the modern standard Arabic and the written form of Arabic that identical between all Arab countries while spoken dialects differ. The survey was re-translated into English by a third person to validate that all questions maintained their meaning as not all words and expressions are one-by-one translatable into the Arabic language.

Due to the missing street names and house numbers, the trainers were chosen as local interviewers. Further, the trainers were already well acquainted with the participants through their mentoring task.

To test the appropriateness of the designed questionnaire, the survey was pre-tested by one of the trainers which led to the revision and modification of the wording and answer options of some questions. The interviewers were trained on the questionnaire on the in advance. During a briefing session, each question was discussed and explained. The person who assisted training sessions of the trainers on the questionnaire stayed in constant contact with the trainers during the data collection phase and was at their disposal for possible inquiries. The trainers were advised to take pictures of the gardens during their interview visits which were transmitted via their smartphones (Annex B). Further every trainer received a template questionnaire at the end of the training session with guiding remarks on how to fill questions that had a more complex structure as for example Question Nr. 21. The data collection took place from mid June to August 2017. The interviewed person within the household was the project participant, which was always one person per household.

The collected data were prepared for the data analysis by coding and clearing them. They were coded into dummy variables and transferred into excel sheets. After clearing the data, 41 surveys remained as the other surveys were either incomplete, illogical or the participants stated that they stopped gardening after 1-2 weeks. Thus, no impact on their food security or economic resilience is expected to have been experienced.

4.3.2 Secondary Data

In this study, secondary data was used to obtain data that have previously been gathered by other researchers through primary data collection for another purpose. Secondary data served to provide extensive background information and to contextualize knowledge on various fields

that are of relevance for this study: Refugees, Food Security, Urban Agriculture, Urban Agriculture for the Food Security of Refugees and Host Communities and at last the Theoretical Framework of the study is presented. Secondary data analysis also enabled this study to make use of the data-collecting skills of more experienced researchers (Castle, 2003). For this study, secondary data collection involved besides definitions and terms on food security and background information on the study area the review of existing research on the impact of urban agriculture to increase food security and to strengthen economic resilience of low-income households in the developing countries. Most secondary data collected for this study origins from published studies in established journals and books that present academic research as well as urban gardening statics provided by the World Bank and the United Nation's Food and Agricultural Organization (FAO).

Demographical data about Syrian refugees in Lebanon and impacts on their host communities were collected from publications of the United Nations Higher Commissioner for Refugees (UNHCR), the United Nations Human Settlement Programme (UN Habitat) and the United Nations Children's fund (UNICEF) as well as the local Issam Fares Institute for Public Policy and International Affairs (IFI) of the American University of Beirut. The main source for statistical data on the magnitude of food insecurity among refugees and locals was obtained from the World Food Programme (WFP).

In addition, six monitoring reports were considered which were made available by ESDU were used to gather background information on the setting of the UA project in Bourj Hammoud.

4.4 Data Analysis

This section will provide information on the data basis used and the analysis carried.

As the results and discussion chapter are aligned with the structure of the literature review, the results chapter consists of three parts. First, and not related to literature, demographical data and data related to the gardens are analyzed descriptively and presented, including frequencies, percentages, ranges and means that allowed for a first impression of the target group.

Second, data that are relevant to the three pillars of food security are presented in regard to the participating households. These data serve to provide general data on the relation of household's and food security and are not related to the garden activity. For food availability, the sources of the household's food are inquired to see where food is mainly available for them. For food accessibility, the financial background of the household's is presented. This includes their income, their source of income and also categorizing each household to be live either below or above the country specific lower¹⁵ and upper¹⁶ poverty lines. For food utilization, the third pillar, the prevalence for intra-household among household's is presented¹⁷.

The third and main part consists of assessing the six research questions of the study which are all related to the UA activity and guided by the structured of the literature review. For each research question, at least one indicator was developed to assess the respective question. An overview is provided in Table 3.

¹⁵ US \$2,4 per capita per day

¹⁶ 4 US \$4 per capita per day

¹⁷ Some scholars attribute intra-household food distribution to food accessibility while other categorize it as food utilization

Research Question (RQ)	Indicators from Questionnaire to Answer Research Questions (IN)	RQ	Indicators from Questionnaire to Answer Research Questions
[RQ1]	[In1] Score 0-6 from the 6-item Food Security Indicator Module [In2] Duration of Food Insecurity	[RQ4]	[In1] Income generated from garden [In2] Reduced Expenditures on Food (savings) [In3] Savings reinvested in food [In4] Income reinvested in food
[RQ2]	[In1] Spending in food stayed the same or went down while intake of Fruits/Vegetables increased [In2] Types of cultivated crops [In3] Frequency of cultivated crops (among all households) [In4] Kilocalories of produced crops [In5] Estimated Yield of cultivated crops [In6] Likert-Scale Score 0-10 for share of crops covering household's meals	[RQ5]	[In1] Enjoyment of gardening [In2] Improved social life [In3] Increased self-esteem [In5] Income generated from garden [In6] Increased financial independence from head of household [In7] Improved life quality
[RQ3]	[In1] Increased access to fruits and vegetables [In2] Increased consumption of vegetables [In3] Increased consumption of fruits [In4] Increased consumption of food other than fruits/vegetables [In5] Variety of fruits and vegetables cultivated [In6] Nutrient composition of cultivated crops [In7] Increased quality of food	[RQ6]	[In1] Sufficient economic access to seeds and fertilizer [In2] Sufficient availability of seeds and fertilizer [In3] Sufficient availability of irrigation water [In4] Recommending UA [In5] Pursuit to continue with garden [In6] Met or exceeded expectations [In7] Aspired amount of produce not obtained [In8] Aspired types of crops not obtained [In9] Aspired financial benefit not obtained

Table 3: Overview of Questionnaire Indicators and related research question

Research Question 1

Research Question 1 aims to determine the state of food security of the participating household's, which includes the severity and duration of food insecurity. The severity is obtained through analyzing the current state of food security among the beneficiary's households [*indicator 1*]. This is carried out by employing the Six-Item Short Form Food Security Module, which is integrated into the survey of the study, 6 month after the project implementation ended. At this point of time around half of households were gardening for 12 months and the other half for around 7-8 months. The module contains six questions that investigates six different experiences related to the ability of accessing food. The module is explicitly described in 4.2.1. *Determination of Food Security Status* The module allows to obtain data that are readily interpretable. As affirmative coded answers are counted and result in a score between 0-6 [*indicator 1*]. The respective score of each household is compared to a pre-set scale, provided by USDA, and based on that households are categorized into either "food secure/marginal food secure" score 0-1, "low food security" score 2-4 or "very low food security" score 5-6.

The different food security level groups result from this procedure. The share of households in each group provides insight into the prevalence and severity of food insecurity among beneficiary households. Further, the each of the six responses will be analyzed further and set into relation to each but also to other characteristics of the household's, for example children. For this reason, the frequency of occurrence of an experience is relevant, which is provided by the USDA survey module but not by the FIES-SM Module¹⁸.

Second, the duration of food insecurity [*indicator 2*] is obtained by considering the data deriving from indicator 1, as the surveyed refers to the last 12 months. According to the WFP (2006),

¹⁸ For more details refer to chapter 4.2.1. *Determination of Food Security Status*

food insecurity lasting for at least six months of the year can be considered chronic. To conclude research question one, the results from the poverty line categorization of household's (above poverty line, below upper poverty line and below lower poverty line) will be compared to the food security status of the participants to evaluate if the data are coherent. Descriptive analysis of the data is deployed.

As a result, RQ1 will attain *Objective Ia) Assess current status of food security among the project participants.*

Research Question 2

The second research question investigates if the urban gardens increased the availability of food and calories among participating households which is expected to decrease hunger. Four indicators were developed to assess RQ2.

To measure for how money households the availability of fresh food increased, in a first step all households that state that their spending on food stayed the same or went down are counted. In a second step for these households, it is assessed if they indicate at the same time to have increased their vegetable and/or fruit consumption [*indicator 1*]. This allows to deduce that for all households where both applies, the availability of fresh food must have increased through their gardens, as their increased intake of fruits and vegetables is not deriving from higher spending on food and thus not obtained from purchases.

To explore the potential for caloric provision through the gardens, it is observed which crops have been cultivated in each household, the frequency production of each crop among all households and the caloric value (kilocalories) of the crops [*indicator 2;3;4*]. Taking together these three indicators enables to make projections on the general caloric provision of garden produce for all household's.

This information are complemented with data collected by the project managers of ESDU on the yield potentials of crops. The data are based on observations and projections of a test garden on the rooftop of one of the agricultural engineers that supervised the project. All crops grown in the test garden and their estimated economic value are provided in Annex C. The projected yields of the table are based on good conditions, as sufficient water and profound knowledge on gardening, fertilizer use, pests and diseases were given. The relevant data were extracted, which are the on crops grown among participating household's. As data on some crops produced among households were not available in the ESDU list, these missing data were added by reviewing literature on the average crop potential in respect to the available planting space of the garden kits. The crop yield data [*indicator 5*] serve to further inform on the actual amounts of produce that can be harvested from each crop over the course of one harvesting seasons¹⁹, which is also relevant for the overall obtainable caloric provision from produce.

Lastly, the share of garden produce comprised in the household's daily meals [*indicator 6*] is determined on behalf of a six-point likert scale. The scale ranges from 0-10, while 0= no coverage and 10= full coverage of meals with garden harvest. Likert points are: 0,2,4,6,8,10. These values are translated into percentages during the data analysis procedure, i.e. a response of 2 equals a meal coverage of 20% out of 100%. The collected data provide an overview of the overall potential of the gardens to contribute to the daily meals of the household's and also how far the values deviate among households. The resulting data allow to deduce on the contribution of the harvest on fullness²⁰ and satiety²¹ of participating households which in return allows for assumptions on possibly relief from hunger symptoms among participants. The data will be analyzed descriptive. The findings will contribute to *Objective Ib): Identify effect of project on food and nutrition security of participants' households*

¹⁹ Refers to the harvesting season of each crop, which can range from all year round to several days or weeks per year

²⁰ Fullness is associated with a satisfied feeling in the stomach which turns into an uncomfortable feeling when a person overeats (PHL, 2008)

²¹ Satiety is the feeling of satisfaction (not being hungry) that lasts after the initial feeling of fullness has subsided. The caloric density of produce determines the duration of fullness and satiety which can be either long-lasting or more temporary (PHL, 2008).

Research Question 3

The second research question investigates if the urban gardens increased the access to fruits/vegetables and increased consumption of fruits and vegetables, separately. Further it is analysed if the dietary diversity among households increased which is related to adequate nutrient intake. Seven indicators were developed to assess RQ3.

To measure if the overall access to fruits and vegetables has been improved [*indicator 1*] for beneficiaries through UA, they are asked if their fruit and vegetable access increased since they joined the program. In contrast to the measured increased availability of fresh food in RQ2, this also takes into consideration fruits and vegetables that do not necessarily stem only from the gardens. Increased income from selling garden produce, for example dried herbs, can also improve the access to fruits/vegetables among household's if money is reinvested in fruits/vegetables, as for example in buying apples which can not be grown in the small gardens. While [*indicator 1*] inquires fruits and vegetables combined, [*indicator 2*] and [*indicator 3*] show the actual increased consumption of fruits and vegetables, separately. Next, it is inquired if there were changes in the consumption and purchase patterns (more, less or same as prior to the project) of the four food groups: bread; rice/legumes; dairy/eggs and meat [*indicator 4*]. Combined with the data from [*indicator 2*] and [*indicator 3*] this discloses if the number of food groups consumed among participants has changed which increases or decreases dietary diversity. Underpinned to this analysis is the basic assumptions that bread and rice/legumes are already consumed by all households, as these are the most common staples in Lebanon. Dietary diversity can also be assessed by analyzing the diversity within a food group, which was done for fruits and vegetables [*indicator 5*]. Produce is grouped into sub-groups as leafy greens and starchy vegetables, depending on what the households have cultivated.

Subsequently, the nutritional values of cultivated crops are analyzed for their minerals and vitamins content. The data are obtained through reviewing literature. The vitamins and minerals of interest are: Vitamins A and C, calcium, magnesium, iron, folate and zinc [*indicator 6*]. As drawn from the literature review of this study, these are important nutrients that are often under-supplied among food insecure households. In a first step, the cultivated crops are analyzed if they contain one of the listed nutrients to a reasonable amount. In a second step, for all crops where the latter applies, the amount of the nutrient of selected crops are compared to the daily recommended intake of the specific nutrient. This is done separately for adults and children under the age of 5²², as these children in most cases require lower amounts to reach their daily recommended intake. By doing so it can be deduced which crops likely contributed to supply the children (under 5) of the project participants with important nutrients which plays a role for their physical and cognitive development. These data are also compared to the frequency of production of the selected nutrient rich crops among all households to estimate the prevalence of provision of the specific nutrient.

Further, it is investigated if households with increased access to fruits/vegetables also perceived an increase of their food quality zinc [*indicator 7*]. This is of interest, as it has been shown²³ that increased quality (freshness) of fruits and vegetables is associated with higher nutrient values. The data will be analyzed descriptive. The findings will contribute to *Objective 1b*: *Identify effect of project on food and nutrition security of participants' households*.

Research Question 4

The fourth research question explores the impact the garden activity has on the female participants and how this could have affected their household in view of food and nutrition security. Only females are addressed as they hold a special role for food security in their families. In countries of the developing world (married) women are often staying at home to take care of

²² The WFP emphasizes, that the first two years of children's life is the most critical time to prevent irreversible damage from childhood undernutrition (WFP, 2016b). However, children under five are also still categorized as being very vulnerable since many growth and development processes are ongoing in their body's (MSF, 2015).

²³ Storage and transportation of fruits and vegetables of only a few days can already cause a loss of up to 30-50% of nutritional constituents (Bellows et al., 2004).

children and household, based on gender-related hierarchies within household's and society. Thus, females are likely to be the key person to carry out UA as they can combine the activity with their other tasks at home. Six indicators were developed to answer research questions 4. First, it is inquired if the women enjoy working in their gardens and cultivating plants [*indicator 1*]. This is done to investigate if gardening is overall well received. Only if this applies, UA can be evaluated to hold potential to be integrated into aid programs addressing poverty issues or food insecurity. If people do not like gardening and are thus not motivated to take proper care of their crops, it is not likely that the potential of urban gardening is reached and thus no benefits derive. Second, women were asked if their social life has increased through the project participation. This likely would derive from having made acquaintances with other female participants of the project and staying in contact with them. Especially refugee households might have difficulties to socialize and establish contacts in a new country which could be facilitated by the project. Having more acquaintances increases the social capital of a household, which can be crucial in unforeseen times of hardship that might occur when the family loses their income source. Social capital can be a vital safety net or last resort to borrow food (food security). Next, it is inquired if the self-esteem of women has increased. As outlined in the literature chapter, this can derive from women perceiving personal achievement through being able to contribute to the well-being and food supply of their families. This itself would be a desirable project outcome. In the context of this study, increased self-esteem can also be of importance in view of indicator 5, which will be explained as follows. The women are asked, if they could raise income from their gardening activity [*indicator 4*]. As found in literature, women invest 10 times more of their income for the well-being of their families than men, which could positively contribute to the food security of household members as children. Important is also, if women obtain greater financial independence from the head of household so that they have the power to allocate their income [*indicator 5*]. Relating this back to indicator 3, women with increased self-esteem might be more relentless to claim a share of the revenue they have created. The last indicator serves to investigate if the women perceive that their overall quality of life has increased. No pre-set definition of the term "life quality" was provided to the respondents. This procedure is based on the assumption that "good life quality" can comprise many aspects and likely contains varying components for each person. The focus was to explore the individual perception of participants if the gardens improved their lives. Even though no definition is given, it is assumed that if the gardens contributed to increased income or adequate amount of food, the overall quality of life of participants would increase. The findings will contribute to *Objective 1d*: *Identify effect of project on food and nutrition security of participants' households*. The results will complement RQ2 and RQ3 to attain *Objective 1b*: *Identify effect of project on food and nutrition security of participants' households*.

Research Question 5

The fifth research question identifies if household's cash availability increased due to direct income or savings generated through the gardens activity. It further serves to explore, on what this cash is spent. Four indicators were developed to assess this RQ4.

First, the households that decided to sell their produce are asked if they were able to obtain profit [*indicator 1*]. Second, it is inquired if households were able to reduce their expenditures on food [*indicator 2*]. This is done by observing how many participants responded to the next indicator [*indicator 3*] where a question was posed to the beneficiaries how they reinvested money saved from growing their own food. At the same time, this questions discloses if the money was spent on food, non-food or other purposes as decreasing debts. The same was asked to the household's that generated income from selling produce, with the same answer categories (food, non-food etc.) [*indicator 4*]. Based on the data the impact of the project to increase the economic resilience of participants is estimated, while the purpose of spending further allows for assumptions on what are the needs of the household's and possibly also allows to make assumptions on the amount of money that was generated/saved (high or low). Descriptive analysis is carried out.

The findings contribute to achieve *Objective 1c* *Identify impact of the project on economic resilience of participant's households*

Research Question 6

The sixth research question aims to compile the lessons learned from the project. Displaying the lessons learned from the project aims to prevent failure, reduce risks, use chances and improve project quality of future projects with a similar purpose. The obtained survey data on participant's challenges, satisfaction and expectations reflect the actual project activity and outcomes, however, this is only one pillar to provide a comprehensive response to research question 6. The second and third data pillar consist of additional primary but also secondary data.

For the first data pillar 9 indicators are developed.

To get insights into possible constraints in regard to gardening inputs, the participants are asked if they always have had sufficient economic access to seeds and fertilizer [*indicator 1*] sufficient availability of seeds and fertilizer [*indicator 2*] and sufficient access to irrigation water [*indicator 3*]. To explore satisfaction of participants with their project outcome, they are asked if they would recommend urban gardening to others [*indicator 4*] and if urban gardening was planned to be continued [*indicator 5*] and if their expectations on the project outcome/their gardens were met or exceeded [*indicator 6*] if they were, at least partly, not satisfied with their gardening outcome. If expectations of participants were not met, there are several reasons surveyed for this being so: Not being able to produce a desired amount of harvest [*indicator 7*] not being able to produce the desired types of crops [*indicator 8*] and not having attained a desired financial benefit [*indicator 9*]. Other variables from the general gardening as previous garden experience, number of workshops visited or gardening kit installed are also taken into consideration for exploring that could have been influencing the satisfaction of the participants who state that their expectations were met. Descriptive data analysis is undertaken.

These findings of data Pillar I (*part 1*) will contribute in attaining *Objective II) Determine factors that can improve similar projects in the future.*

In regard to the secondary data relevant to complement the lessons learned section, the monitoring reports on the project by ESDU are reviewed to identify challenges and opportunities that were noted during the project planning, kickoff and implementation phase (Pillar II). A summary of the results is provided in Annex F. A third data pillar information from cleared surveys (Pillar III). Several surveys were cleared as the participants indicated that they stopped gardening after one or two weeks, as no impact on their food and nutrition security can be expected. However, in these cases participants often remarked the reasons for struggling with their gardens which are of importance for this section. A summary of the findings is provided in Annex F.

The findings of data Pillars II-III (*part 2*) complement information obtained in *part 1* and together attain *Objective II) Determine factors that can improve similar projects in the future.*

Lastly, an overview of all encountered challenges, related risks and possible solutions to overcome them and opportunities of the project are provided in a table. On the one hand recommendations are made to overcome constraints and on the other hand it is implied which positive implications of the identified opportunities can hold for the participating households.

4.5 Limitations of the Study

As the data collection partly fell into the month of Ramadan their daily food consumption and related physical sensations as hunger can not be expected to reflect their average everyday situation regarding food intake. To obtain representative data, the USDA Food Security Module was adapted to the 12-months version instead of the 30-day version. Under normal conditions, the 30-day version is expected to provide somewhat more precise data as the 12-month version as 12 months are a long period to recall memories. However, in the context of this version the 30-day version would have provided inaccurate data.

Further the training of the trainers took place during Ramadan which might have had impairments on their concentration. This could not be evaded due to the time constraints of the research.

In this context, another weakness of the study is that the trainer conducted a survey for the first time and are not experienced interviewers. However, the circumstance that the trainers know the interviewees very well can be beneficial to obtain valid data as the participants are likely to trust them. Employing interviewers that are not familiar with the beneficiaries, in contrast, might have caused mistrust on the purpose and use of data collection and participants might have rejected the interviews. Especially for refugee household's this is of great relevance, as many do not hold a legal residence permission and fear eviction.

Another constraint occurred in respect to the sample size of the survey. The initial aim was to conduct total population sampling as the number of participants is not sufficient to apply another sampling method. However, the sample size was reduced to around 75%²⁴ as one of the four trainers unforeseen withdraw from his duty to conduct the survey among the households he was responsible. As the data collection phase had already started when this occurred, he could not be replaced due to constraints in time and budget.

Initially it was planned to apply statistical analysis to investigate on correlations between several variables of the study, however, it was decided to refrain from this approach as after clearing the data 42 questionnaires remained which partly resulted in low sample sizes for some variables that would have been of interest for statistical analysis as type of installed garden kit. Thus, the data analysis was adopted to descriptive analysis.

Another limitation to the study is the circumstance, that the conducted baseline data on the project were not made available by YMCA, the partner NGO of ESDU. Consequently, it is not possible to compare the household's food security state pre- and post-project implementation which could further provide information of the gardens' impact. However, out of the 22 questions of the baseline survey only two directly addressed the food security state of participants: "5. In the past [4 weeks/30 days] did you or any household member go to sleep at night hungry because there was not enough food?" and "6. How often did this happen in the past [4 weeks/30 days]?". It remains questionable, if on behalf of the obtained data, a reliable and comprehensive categorization of the households into different food security states prior to the project participating would have been possible.

²⁴ surveys and each trainer supervised around 25% of the households; estimated total population size was 73 households

5 Results and Discussion

This chapter is divided into two parts. The first part comprises the results of the conducted survey and which lays the foundation for the second part, a discussion of the results.

In total 51 surveys were collected, which resulted after clearing the data in 41 surveys that form the basis for the upcoming analysis.

The results section first introduces the findings on the general demographic data of participants, followed by data around their gardening activity as garden characteristics and garden resources. Next, the descriptive results to Objective I: *To evaluate the impact of the project on beneficiary households* and Objective II *Determine factors that can improve similar projects in the future* will be presented by analyzing the responses of the different indicators (Table 3) that have been developed to answer the six research questions of the study:

RQ1: What is the prevalence, severity and duration of food insecurity among participant's households?

RQ2: Do the urban gardens increase the availability of food and calories among participant's households?

RQ3: Do the urban gardens contribute to increased fruit and vegetable intake and increased dietary diversity among participant's households?

RQ4: What impact does gardening have on female participants? What are possible positive implications from that for the food security of their households?

RQ5: Did cash availability of households increase through their urban garden activity? How did the participants spend this extra cash?

RQ6: What are the lessons learned from the project?

In the second part of this chapter, the discussion, results will be interpreted. The findings will be compared to findings from other studies drawn from literature to evaluate or support them. The section further serves to describe the significance of the survey findings and if applicable, state new understandings and insights on the research problem. Recommendations will be proposed that can help improve outcomes in cases where outcomes were not optimal or to highlight best practices. At the end of the section, the findings will be summed up and discussed in regard to the conceptual framework of this study.

5.1 Main characteristics beneficiary households

The conducted demographic data served to create a profile on the project participants and their households. An overview of age, household size, nationality, educational status, employment status and head of household are provided in the Table 4.

<i>Characteristics of Household's</i>		<i>Min.-Max.</i>	μ	<i>Frequency (n=41)</i>	<i>Percent- age %</i>
<i>Age Category (Years) of Participant</i>	20-24	24-65	40,6	1	2,4
	25-29			2	4,9
	30-34			8	19,5
	35-39			12	29,3
	40-44			7	17,1
	45-49			3	7,3
	50-54			2	4,9
	55-59			2	4,9
	60-64			3	7,3
	65-69			1	2,4
<i>Household size</i>	1	1-8	4,5	0	0
	2			4	9,8
	3			7	17,1
	4			11	26,8
	5			10	24,4
	6			2	4,9
	7			6	14,6
	8			1	2,4
<i>Head of household</i>	Participant (1 male)			6	14,6
	Husband			27	65,8
	Other			8	19,5
<i>Educational Status of Participant</i>	No formal education			0	0
	Primary Education			15	36,6
	Secondary Education			24	58,5
	Vocational Training			2	4,9
	University degree			0	0
<i>Participant Contributing to income</i>	Yes			4	90
	No			37	10

Table 4: Overview demographic data of participants and their households. Source: Author's survey

Most participants fall in the labor force age, as two thirds are aged between 30-45 years. Almost every third participant was Lebanese while the rest held the Syrian citizenship (71%). All participants except of one were female. This allows for the assumption, that possibly positive findings regarding increased independence or gained confidence will be for the benefit of women and their empowerment.

In terms of education, the results showed that more than half of the households hold a secondary degree but the share of those with vocational training was very small.

In regard to household size and composition, it showed that a 12% of households were female-headed and two thirds all households had children living with them (68%). The biggest household had 8 family members and the smallest 1 member with an overall average of 4,5 members and 2,4²⁵ children. No household had more than 6 children. A total of 83 children were inquired

²⁵ Considering only households with children

from the age of 1 to 19 years old. Of these 83 children, 20% were under the age of 5 at the time of the distribution of the first gardening kits, being a critical age threshold for malnutrition due to important cognitive and physical development processes. These very young children lived in 14 households, which means that half of all households with children had children under 5 at the time of data collection.

5.2 Main characteristics Gardens

In this section, the general findings about gardening related resources and skills are displayed. Of all participants, 32% stated that they had obtained gardening experience prior to their urban garden. Three fourth of those were Syrian.

The most frequently installed gardening kit among all households was the horizontal kit, found in 21 households. The second most common garden installation was a combination of horizontal and vertical kits in 16 households whereas 4 households merely had the vertical kit. Table 5 shows the distribution of the utilization of all different gardening kits among the participants in percentage including the composting unit.

<i>Garden Kit</i>	<i>Number of Households</i>	<i>Percentage of Households</i>	<i>Minimum</i>	<i>Maximum</i>
<i>Horizontal Kit</i>	21	51 %	2	12
<i>Vertical Kit</i>	4	10 %	10	20
<i>Horizontal and Vertical combined</i>	16	39 %	-	-
<i>Composting Unit</i>	23	56 %	0	1

Table 5: Types of garden kit used in beneficiary households. Source: Author's survey

The average number of horizontal crates per households were 6 crates and for vertical kits the average numbers of bottles was 16. The distribution of which kit to which household depended on the estimation of ESDU which combination would best fit the given conditions as available space and household size. Households with only very little space on a balcony received a vertical kit only, as these can be easily installed to a wall and do not take up much space. Kits of households that dropped out were redistributed to other participants. More information on the different kits can be found in Annex C.

The major source of water for irrigation was tank water (80% of households), and only 22% additionally or exclusively relied on piped water. This reconciles with the findings on the study area, that functioning pipe water system are rare in Beirut and conditions are aggravated in the poorer urban outskirts as Bourj Hammoud. Only one person supplemented the irrigation water with rainwater collection.

ESDU delivered an extensive introduction workshop with lessons on gardening and the use of the different gardening kits, including a theoretical and practical part. The attendance was obligatory for each beneficiary. The workshops were repeatedly held as new participants were continuously recruited during the implementation phase. Participants were free to revisit the introduction workshop to strengthen their knowledge. Of all participants (respondents rate n=40), 20% visited 2 workshops and 10% attended 3 workshops. These findings indicate, that most participants felt prepared after attending the introduction session once.

The project initiators gave the selected participants the freedom to choose for themselves if they want to use their produce for their families, to sell surplus produce or to do both. Surveying the participants on their intention of dedicating their produce to (selling or self-provision), all were planning to use their produce for their own household consumption and an additional 7% also attempted to sell surplus produce.

In total, 27 different crops were cultivated as part of the UA project. The variety of planted fruits and vegetable ranged from only 2 different types of crops per households up to 14 different types, grown throughout different seasons.

5.3 Food Security

5.3.1 Three Pillars of Food Security

In this section, data of participant's households are presented that are relevant to the three pillars of food security: Food Availability, Food Accessibility and Food Utilization.

Food Availability

Source of Food:

As stated in the literature review, food availability is consistent in Lebanon as there is sufficient food made available for the population, secured mainly by food imports.

In terms of food procurement, 88% of the participants procure their food from supermarkets, 59% receive food vouchers which are issued in supermarkets and corner shops cooperating with the WFP and another 15% comes from family, friends/neighbors, or gardens, respectively. Thus, food is mainly sourced in shops and supermarkets.

Food Accessibility

Financial Status of the Interviewed Participant's Households:

In Table 6 shows an overview of the different income sources of participating households are provided. In total, 29% of households follow more than one strategy to generate or receive income. In addition, most beneficiary households (85%) have only one family member working whereas among the remaining 15% not more than two family members raised revenues.

<i>Households Source of Income</i>						
<i>Income Source</i>	<i>Occasional jobs</i>	<i>Remittances from family</i>	<i>Employed Salary</i>	<i>Own business</i>	<i>Savings</i>	<i>Borrowings</i>
<i>All households(hh) (n=41)</i>	90%	29%	7%	2%	2%	2%
<i>Lebanese hh (n=12)</i>	83%	50%	17%	0%	0%	8%
<i>Syrian hh (n=29)</i>	93%	21%	10%	3%	3%	0%

Table 6: Income source of participant's households. Source: Author's survey

Occasional jobs are the dominant source of income which shows that the project does successfully targeted the more vulnerable population and is further consent with findings in literature, as accessing the regular labor market is especially compounded and limited for refugees.

These findings also suggest, that the surveyed Lebanese are likely only slightly better off than the Syrians residing in their communities. This also corresponds with findings from literature, as poverty levels among Lebanese are rather high with an estimation of 41% (IFI, 2014). The circumstance that half of Lebanese households receive money from family members is also not unusual as often family members work in other parts of the country where work might be more available and often male members periodically relocate to the gulf countries. The latter strategy is indeed also applied by many well-off Lebanese, however, depending on obtained education level the accessible job opportunities and labor conditions differ widely.

Of the interviewed participants, which are the main care takers of the gardens, 10% stated to have contributed to the income of the household prior to the project launch.

Table 7 provides an overview of the income distribution among the households. The available cash for living per household is ranges from low as US \$100 to a maximum of US \$870 per month with an average of US \$507, a standard deviation of US \$207 and a respondent's rate of 90% (37 households). Breaking it down to per capita income per month, the average value of available cash per person was US \$122, ranging from low as US \$25 up to US \$365. Smaller households with 1-4 members had in average 46% more income per capita per month available

(US \$142) than families with 5-8 members (US \$96). Table 7 indicated the income distribution among the participant's households.

<i>Characteristic</i>	<i>Income Range</i>	<i>Min.- Max.</i>	μ	<i>Frequency (n=41)</i>	<i>Percentage %</i>
Monthly In- come of Household	0-100 US \$	100 US \$ - 870 US \$	507 US \$	0	0
	100-200 US \$			2	4,9
	200-300 US \$			3	7,3
	300-400 US \$			5	12,2
	400-500 US \$			9	22
	500-600 US \$			3	7,3
	600-700 US \$			6	14,6
	700-800 US \$			3	7,3
	800-900 US			6	14,6
	was not precised			4	9,8

Table 7: Distribution of participant's households into income ranges. Source: Author's survey.

The income distribution shows, that almost half of all households (46,4%) live on less than US \$ 500 per month.

Kukrety&Al Jamal (2016) calculated that the current upper and lower poverty line for Lebanon amounts to US \$4 and US \$2.4 per capita per day. In Table 8 an overview of the share of all households falling under which poverty line is provided²⁶. Further, the share within the two nationalities is presented and the average available income for all household within a poverty level group.

<i>Poverty Status of households</i>	<i>All hh in % (n=37)</i>	<i>Nationality</i>		<i>Total Income in US \$ per month</i>	<i>Capita Income In US \$ per month</i>
		<i>Syrian (n=25)</i>	<i>Lebanese (n=12)</i>	μ	μ
<i>a) Of all hh living under US \$2,4 or less per capita per day (lower Lebanese poverty line)</i>	22%	24%	16%	248	52
<i>b) Of all hh living on US \$2,4 -\$4 per capita per day (upper Lebanese poverty line)</i>	37%	36%	42%	509	96
<i>a+b) Of all hh living under upper and lower poverty line;</i>	59%	60%	58%	414	80
<i>c) Of all hh living above poverty line</i>	41%	40%	42%	645	183

Table 8: Households classified into upper and lower Lebanese poverty lines set in relation to different demographic variables. Source: Author's survey

μ =mean; n=sample size; hh=households; total sample size for income: n=37hh; poverty lines based on Kukrety&Al Jamal (2016)

According to the survey the share of Lebanese and Syrians living above and below the national poverty lines do not show a significant difference. However, the indicate that Syrians seem to be more prevalent to live under the lower poverty line of US \$2,4. Reasons for that could be, that they have less access to the labour market or receive lower payments than Lebanese.

The results further show that households above the poverty line have on average 128% more income per capita per month than all households living under the poverty line. The average capita income per month among households living on US \$2,4-\$4 shows to be by 83% higher than those living under US \$2,4 per capita per day. This value being almost two-fold indicates, that

²⁶ Calculated with an average of 30 days per month and including all those living under lower poverty lines (US\$ 2,4) as well

there is a relatively wide income gap among all households living under the upper poverty line (US \$4).

Food Utilization

Intra-household food distribution:

Survey findings indicate that positive project achievements in terms of food security highly contribute to the food and nutrition security of children. Based on the results of the survey a clear priority is given to the well-being of children in regard to intra-household food distribution, as 89% of the households with children responded to put them first. Further, of the 16 households who had children under the age of 5, 81% stated to prioritize their children. Looking at child and non-child households, besides feeding children first (67%), consequent priorities for food distribution were devoted to elders (20%), equal sharing (10%), the head of household (7%) and explicitly male-members (2%).

5.3.2 Severity and Duration of Food Insecurity

Food Security Status

On behalf of the USDA Guide to Measure Food Security the households are categorized into the different food security levels (FSL) based on their responses to the “Six-Item Short Form” survey module. For the FSL of households, the three possible outcomes are *food secure* referred to as “High/Marginal Food Secure”, *food insecure without hunger* also referred to as “Low Food Secure” and *food insecure with hunger – moderate* referred to as “Very Low Food Security”²⁷. The distribution of the three FSL among participating households is shown in Table 9 below:

<i>Food Security Status</i>	<i>Obtained Score from Food Security Module</i>	<i>Households total</i>	<i>Households in %</i>
High/Marginal Food Secure (H/MFS)	5-6	29	71%
Low Food Secure (LFS)	2-5	5	12%
Very Low Food Security (VLFS)	0-1	7	17%

Table 9: Determination of Food Security Levels among beneficiary households. Source: Author’s survey

That more than two thirds of households are categorized as being in a state of very low food security allows for the first assumption that the impact of the UA project did not suffice to transfer most of participants to a more moderate state of food insecurity (low food security).

The prevalence food insecurity showed to be equal among Syrian and Lebanese household’s, as 82,8% and 83,3%, respectively, are affected by low or very low food security.

The detailed responses to the six-item USDA survey module (five questions with one sub-question) are summed up in Figure 4²⁸.

²⁷ The characteristics of each of these levels are provided in the methodology chapter.

²⁸ Detailed results are provided in Table 29, Annex J.

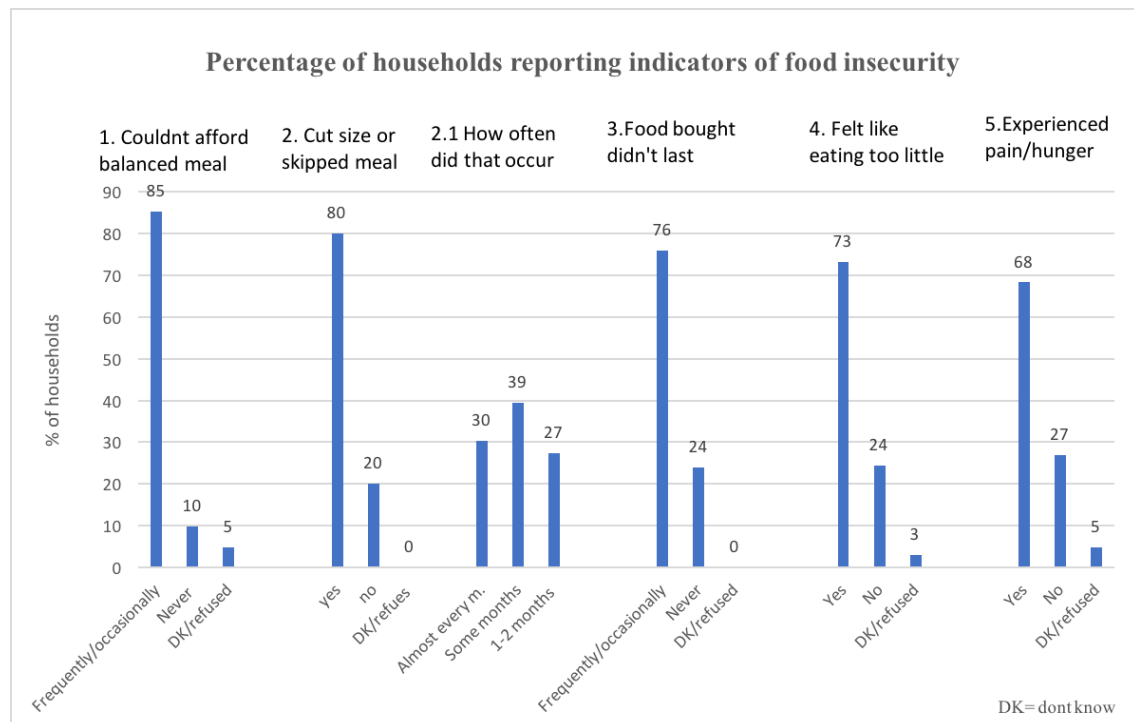


Figure 4: Participants responses to the six-item food security module. Source: Author's survey

*Values for "2.1 How often did that occur" sum up to 96% as 4% of the responses were not decipherable.

The first four questions of the six-items (1;2;2.1;3) refer to the households of interviewees while the last two questions (4;5) only refer to the personal experience of the interviewee.

Affordability of a balanced meal:

According to the results of the survey²⁹, 34% of the interviewees claimed not to be able to afford a balanced meal on a frequent base and 51% on an occasionally base within the last 12 months.³⁰ It is assumed, that the households prior to the project mainly consumed staple foods. Staple foods, including cereals, roots, tubers, and basic pulses, constitute critically important sources of calories for households worldwide. Given their low overall value, they comprise a minority of food expenditures for most households. The exception is the poorest households, who spend a disproportionately high share of their overall income on food, and thus largely comprised of relatively cheap and caloric dense staples. A monotonous staple based diet can cause micronutrient problems, especially among children (WHO, 2015.). The findings indicate, that the gardens might hold an important role as data suggest that most household's lack economic access to a variety of produce on a constant base. UA could possibly provision these households with an additional source of different nutrients deriving from fruits and vegetables.

Frequency of cutting or skipping meals among participating households:

Among all surveyed households, a quarter (24%) cut sizes/skipped meals almost every month³¹. One third (32%) applied this coping strategy for some months³² and 22% did this for 1 or 2 months within the past 12 months. The findings that 80% of participants cut/skipped meals reconciles with the findings of the latest VASyR report (2017), as adults were reported to consume in average 2,01 instead of 3 meals per day. Children in contrast, were reported to consume 2,41 meals per day, thus, the parents must have preferred them during the intra-household food distribution. The latter is likely to apply for participating household's, as almost all respondents stated to put children first regarding intra-household food distribution. To conclude, the percentage of household's cutting/skipping meals is still very high, but not all household members were necessarily affected to the same extend.

²⁹ Responses to Question 1 of the six-item Food Security Module

³⁰ The term "frequently", "occasionally" and "balanced meal" are in the methodology chapter of this study

³¹ For 10-12 months of the year

³² 3-9 months

Stability of food supplies over time:

Of all the households (76%) that who ran out of 23% were affected frequently and 77% occasionally.

In Table 10, the responses of the item 3. *Ran out of bought food* are set in relation to certain characteristics of the households (food vouchers and having children).

<i>Food Security Module Item:</i>	<i>Characteristics of households (hh)</i>		
	<i>Had children</i>		<i>Received food vouchers</i>
	<i>Age 0-19</i>	<i>Age under 5</i>	<i>Yes</i>
<i>Of all hh who: Ran out of food occasionally or frequently</i>	71%	42%	68%
<i>Of all hh who: Ran out of food <u>occasionally</u></i>	67%	96%	63%
<i>Of all hh who: Ran out of food <u>frequently</u></i>	86%	14%	100%

Table 10: Food Security Module Items and their respective characteristics of households. Source: Author's survey

All households that claimed to ran out of food frequently received food vouchers (100%). This number reduced to 63% among the ones claiming to run out of food occasionally. It could indicate that the food assistance program has been successful to target households experiencing frequent food shortage.

Adverse findings are that almost all households that ran out of food occasionally had children under the age of 5 (96%). This suggests that children being in a critical state of development were repeatedly deprived from food with possibly negative long-term effects on their physical and mental health. For these households, additional provision of food with home produce might have been of utter importance, as it possibly contributed to their resilience in periods of (economic) food shortages.

Respondent's experience of food deprivation:

More than two third of respondents felt like eating not enough food and suffered from hunger. It could indicate, that garden produce did seemingly not suffice to add enough food to the household's meals to prevent this from happening. However, garden produce might have alleviated their situation.

Of all respondent's that felt like eating less than they should, 68% stated that the vegetable and/or fruit consumption of their households had increased through their participation in the UA project. The same was the case for 64% of all households that suffered from hunger due to a lack of food within the last 12 months.

However, as these responses refer to the personal experience of the interviewee, it is possible that children were not equally affected. Thus, in cases where fruit and vegetable consumption increased, the gardens produce might still have prevented or alleviated children's experiences from food deprivation.

Coping strategies to make food last longer:

Of all participants who had indicated to cut down or skip meals, a total of 94% felt like eating not enough food and 90% indicated to have run out of food nevertheless at some point during the past year. Thus, only a tenth of the households cutting portions/skipping meals indeed succeeded to prevent running out of food by stretching their food supplies.

Of all the households that ran out of food at some point within the last 12 months, 90-93%³³ experienced physical constraints in form of painful hunger, resulting from their food depriva-

³³ The remaining 10% make up 3 households of which one did not answer the question. The value was coded negative based on the guidelines of the food security module to imputed missing values to categorize the households into a FSL. However, as the imputed value is not a 100% certain, a range was provided here.

tion. The remaining 7%-10% are likely to have applied another coping mechanism, as asking friends or neighbors, which successfully helped them to prevent acute painful hunger.

Duration of Food Insecurity

In regard to the circumstance, that the obtained food security status of participating households is based on their conditions and experiences of a period of 12 months, it can be concluded that all households that showed to have an insecure food security status (83%) suffer from chronic food insecurity³⁴.

5.3.3 Increased Availability of Food and Calories through UA

Availability of Food

The results showed that quarter of all participants (24%) had indicated to spend less money on food purchases since joining the project. Almost all these households (90%) increased their fruit or vegetable intake (or 22% of all households) which is estimated to be the reason for having decreased their spending on food, as formerly purchased produce was replaced or substituted by garden produce. For the remaining 10%³⁵ other reasons, must have affected their decreased food purchases as an increase in rent or other non-food items.

The remaining 76% of all households stated that their spending on fruits and vegetables stayed the same. Of these households, 61% (or 46% of all households) increased their fruit or vegetable intake which indicates that their availability of fresh food must also have increased.

Thus, it can be deduced, that for at least 68% (46% and 22%) of all households the availability of fruit and vegetables did increase through UA.

Available Calories from Garden Produce

Types and Frequency of Produced Crops:

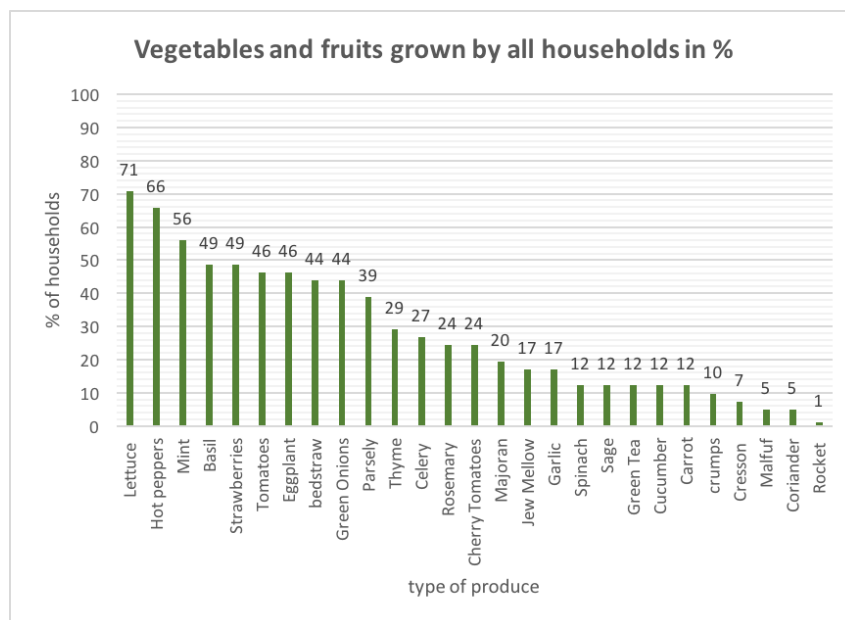


Figure 5: Frequency ranking of beneficiary household's produce. Source: Author's survey

³⁴According to the WFP (2006): "Chronic food insecurity is a long-term or persistent inability to meet minimum food consumption requirements. As a rule of thumb, food insecurity lasting for at least six months of the year can be considered chronic."

³⁵one household

In total 27 different crops were cultivated by participating households. Figure 5³⁶ provides an overview of the frequency of plants produced by all households.

The crops that were most commonly cultivated among households (hh) were lettuce, hot peppers and mint while coriander, the local cabbage malfuf and rocket were least common. To elaborate further on these cultivation patterns, Table 11 was created which provides an overview of which crops have been planted by participants, which crops (seeds/seedlings) have been supplied by the project³⁷ and the caloric density per serving of the crops.

<i>Section 1</i> <i>Cultivated by Household and seeds/seedlings provided and kcal per serving (cup or tbsp).</i>		<i>Section 2</i> <i>Seeds/Seedlings provided but not Cultivated and kcal per cup serving or tbsp.</i>		<i>Section 3</i> <i>Cultivated by household but not seeds/seedlings provided kcal per cup serving or tbsp.</i>	
Hot Peppers 4 kcal	Malfuf (Cabbage) 21 kcal	Beans 206 kcal*	Watermelons 139 kcal	Mint 22 kcal	Rocket 5 kcal
Cucumber 13 kcal	Celery 27 kcal	Sweet Corn 210 kcal*	Broccoli 21 kcal	Basil 6 kcal	Cress 16 kcal
Eggplant 66 kcal*	Garlic 4 kcal (tbsp.)	Sweet Potatoes 249 kcal*	White potatoes* 166 kcal	Strawberries 49 kcal	Jew-Mallow ³⁸ 40 kcal
Tomatoes 32 kcal	Lettuce 8 kcal	Pumpkins 49 kcal*	Kale 34 kcal	Sweet-scented bedstraw 2 kcal (tbsp.)	Sage tbsp. 2 kcal
Crumps(Kohlrabi) 37 kcal	Spinach 46 kcal*	Squash 20 kcal	Okra 33 kcal	Parsley 22 kcal	Green tea 2 kcal (tbsp.)
Carrots 52 kcal	Green Onions 16 kcal (1/2 cup)	Zucchini 20 kcal	Asparagus 40 kcal*	Thyme 7 kcal (tbsp.)	Coriander 4 kcal
Cherry-Tomatoes 32 kcal		Pea 134 kcal*	Cauliflower 40 kcal	Rosemary tbsp. 2 kcal	Marjoram tbsp. 2 kcal
		Bell Peppers 39 kcal	Swiss Chard 35 kcal*		
		Beets 75 kcal*	Radish 25 kcal		

Table 11: Comparison of crops cultivated by participants and seeds distributed during project. Source: Author's survey

kcal: kilocalories; tbsp.=tablespoon; *cooked or baked. Source of nutrition data: USDA, 2018

The comparison of provided and cultivated seeds shows, that there are inconsistencies that need to be better understood³⁹. In view of the crops of section 3, it is conspicuous that these crops mainly include herbs, along with strawberries and the region specific jew-mellow, edible leaves that are mainly processed into pastes for sauces. It is not unexpected that these crops were cultivated, as the kitchen of Lebanon and Syria integrate many herbs in their traditional plates. Further, seeds are affordable, widely available and very suitable for the vertical kits.

Among the crops of section 2, many require relatively much space for one single plant (sweet corn, pumpkin, watermelon) which might have led participants to the decision to use the space for more plants of another kind or to plant a greater variety of crops instead. Others grow rela-

³⁶ Corresponding data table provided in Table 27, Annex J.

³⁷ List provided in Annex E

³⁸ Local crop that produces leaves that are utilized and prepared similar as spinach

³⁹ The list that serves as data base of the table was provided by ESDU. It must be noted, that the accuracy of these data is somewhat unclear, as varying data are found in the monitoring reports and data from the pilot garden which served to measure data on yields and profitability of garden produce (all by ESDU). As the quantities seed/seedlings was not tracked by the project, no final statement can be made with certainty on which crops were provided to participants. However, the carried out analysis on base of the table still serves as a useful comparison of calories provided by cultivated garden produce and how crops not cultivated by participants differ in calories but also in their estimated suitability for the garden kits of this project (crates/plastic bottles).

tively deep in the soil (white potatoes, sweet potatoes, asparagus) which might not have worked well with the dimensions of the horizontal crates⁴⁰. Further, many crops of this category also have a long cultivation time which might not have made them a first choice compared to other, faster growing, crops.

Another aspect that must be taken in consideration is, that the trainers each were responsible for a specific area in Bourj Hammoud municipality (Nabaa, Dawra, Bourj Hammoud). As installation of garden kits took mainly place during two sessions in May/June and two sessions in November, it is likely that different seeds/seedlings have been distributed during these two seasons and they might have varied among areas. As one the data on households of one trainer could not be obtained, it is possible⁴¹, that some more of the provided crops have been distributed and cultivated there.

Caloric Values of Produce

In regard to caloric values of the crops, it shows that the crops of section 3 are overall very low in calories with exceptions of strawberries and jew-mallow.

The crops of section 2 are higher or even much higher (potatoes, corn, beans, peas) than those of section 3. The latter crops, mainly herbs and spices, are overall more easy-to-grow, as they do not require much maintenance, fertilizers, less prone to diseases and require less irrigation water. As summer months can be very hot in the study area, this might be an important factor when it comes to crop choices. Thus, the participants either preferred adding the listed crops for reason of taste or because they were not successful or interested to cultivate the other crops, either to lack of inputs, skills, space or because the cultivation time was too long.

For the crops of section 1, the caloric density is overall moderate with some exceptions (garlic, onions, lettuce and peppers) that are low or negligible in calories. The term moderate, however, must be regarded relative as caloric density stemming from vegetables is often overall rather low in comparison to food groups as dairy or bread. Crops with higher caloric potential are foremost legumes, starchy vegetables and certain fruits, which were all not grown among the participating households.

To conclude, 70% of the crops cultivated among participants are mostly low⁴² or even negligible⁴³ in their caloric value per serving⁴⁴. Produce with moderate⁴⁵ caloric density are eggplants, strawberries and tomatoes (normal and cherry-tomatoes) which were all produced by around a half of all household's, as well as crumps, carrots, spinach and jew-mallow which, however, were not frequently produced (less than 17% of household's).

Estimated Yields of Produce

It is estimated that the crates provided to the participants had the measurements of approximately 30 cm wide x 45 cm length x 15 deep cm comprising 18 L of soil while the plastic bottles hold 2 liters of soil and with a diameter of 10 cm⁴⁶. Table 12 and Table 13 provide an overview of the potential yields of relevant crops that were cultivated among participants.

⁴⁰ Approximately 45 cm length x 30 cm wide x 15 cm deep; data drawn from another project (FAO, 2017) where AUB provided the crates. It is likely that the same crates were used, as pictures of both projects confirm this

⁴¹ One trainer withdrew from his task to collect surveys, further details are found in the methodology chapter

⁴² 10-30 kcal per serving

⁴³ less than 10 kcal per serving

⁴⁴ cup or tablespoon

⁴⁵ more than 30 kcal per serving

⁴⁶ Value based on an average 2 Litre plastic water bottle available in supermarkets

<i>Potential Yields of Vertical Gardening Kits (Crates)</i>						
<i>Type of Crop</i>	<i>Time to maturity (1st harvest)</i>	<i>Harvest (when mature)</i>	<i>Planting time</i>	<i>Growing Season</i>	<i>Average number of Harvests</i>	<i>Average yield (bunches) per crate/harvest</i>
Celery	seedlings: 1 month	Every 15 days	seedling: October	September to February	12	6 ⁴⁷
Lettuce	seedlings: 2 months	once	seedling: October	September to November	1	8
Green onions	bulb: 20 d	Better once	bulbs	Can be grown all year round	12	4
Green garlic	bulb: 20 d	Better once	bulbs	Can be grown all year round	12	7
Coriander	seeds: 1 month	Every 20 days	seeds: February	February to April	5	7
Rocca	seeds: 1 month	Every 20 days	seeds: February	February to April	5	10
Mulukhiyah (Jew-Mallow)	seeds: 1 month	once	seeds: March	March to May	1	1 kg of green leaves
Parsley	seeds: 1 month	Every Month	seeds: January	Can be grown all year round	12	5
Cherry tomatoes	seedlings: 2 months	Harvest mature fruits	seedling: April	April to September	Harvest mature fruits	800g/plant/4plts
Hot Peppers	seedlings: 2 months	Harvest mature fruits	seedling: April	April to September	Harvest mature fruits	400g/plant/8plts
Cucumber	seedlings: 2 months	every 2 days	seedlings: May	May to September	every 2 days	3kg/plant/2
Mint ⁴⁸	roots: 10 days in summer	Every 10 days	roots: April	All Year	25	25

Table 12: Projected Yields of Horizontal Gardening Kits. Source: Developed by ESDU; plts.=plants

<i>Potential Yields of Horizontal Kits</i>						
<i>Type of Crop</i>	<i>Time to maturity (1st harvest)</i>	<i>Harvest (when mature)</i>	<i>Planting time</i>	<i>Growing Season</i>	<i>Average number of Harvests</i>	<i>Average yield (bunches) per bottle</i>
Celery	seedlings: 1 month	Every 15 days	seedling: October	September to February	12	1
Lettuce	seedlings: 2 months	once	seedling: October	September to November	1	1
Green Onions	bulb: 20 d	Better once	bulbs	Can be grown all Year round	12	1
Green Garlic	bulb: 20 d	Better once	bulbs	Can be grown all Year round	12	1
Cherry Tomatoes	seedlings: 2 months	Harvest mature fruits	seedling: April	April to September	Harvest mature fruits	800g
Hot Peppers	seedlings: 2 months	Harvest mature fruits	seedling: April	April to September	Harvest mature fruits	400g
Marjoram ⁴⁹	seedlings: 1 month	Every Month	all year	All Year	8	1
Thyme*	seedlings: 1 month	Every Month	seedling: Jan	All Year	5	1

⁴⁷ 1 Bunch of Celery is made-up of 5-6 leaves⁴⁸ 1 Bunch of Mint takes-up to 10 cm²⁴⁹ no harvest in hot summers

Rosemary*	seedlings: 1 month	Every Month	seedling: March	All Year	15	1
Mint*	seedlings: 1 month	Every 20 days	seedling: March	All Year	25	1
Sage	seedlings: 1 month	Every Month	seedling: March	All Year	10	1
Green Tea*	seedlings: 1 month	Every Month	seedling: April	All Year	10	2
Basil ⁵⁰	seedlings: 1 month	Every 15 days	seedling: June	June to November	15	1

Table 13: Projected Yields of Vertical Gardening Kits. Source: Developed by ESDU

*every plant of marjoram, thyme, rosemary, mint, sage and green tea = 1 bunch;

For the crops that were not cultivated in the test garden the following projections⁵¹ were made based on literature:

- one crate with carrots can provide up to 1,6 kg⁵² of produce per season
- one crate with strawberries around 280g⁵³ per season
- one crate of (normal) tomatoes around 5kg of produce⁵⁴ per season
- one crate of crumps (Kohlrabi) around 6-8 piece⁵⁵ per cultivation
- one crate of eggplants around 6,1 kg produce⁵⁶ per season
- one crate of spinach around per 500g of produce⁵⁷ per season

All values of this section may vary depending on soil composition, available input resources, weather conditions and gardening skills, however, they provided an overall impression of the yields that could be attained by participants of the UA project.

Share of Produce Covering Meals of Household's

In addition to the caloric provision of the cultivated crops by households, the share of produce covering household's meals is another factor that should be taken into consideration. Table 14 provides an overview of the percentage of garden produce covering the daily meals of participant's households.

<i>Percentage of Meals covered by garden produce</i>						
<i>% of meals covered</i>	<i>0%</i>	<i>20%</i>	<i>40%</i>	<i>60%</i>	<i>80%</i>	<i>100%</i>
<i>Households absolute and in %, having attained the respective coverage</i>	16hh 39%	21hh 51%	4hh 10%	0hh 0%	0hh 0%	0hh 0%

Table 14: Percentage of garden produce covering the daily meals of participant's households. Source: Author's survey

The results show that half of participants covered around 1/5th of their meals with produce from their gardens. While a coverage of 20-40 % of meals with garden produce does not necessarily imply that 20-40% of calories stem from the gardens, it can imply positive contributions to the

⁵⁰ Every 3 plants of basil = 1 bunch

⁵¹ size per crate: 45 cm length x 30 cm wide x 15 cm depth; no data found on sweet-scented bedstrew

⁵² 10kg/ m²; 1m² fits 6 crates (Strawbridge, 2018).

⁵³ Up to 16800kg/ha; 1 m² fits 6 crates (Galic et.al, 2014)

⁵⁴ 1m² can provide around 200 tomatoes (30 kg) (FAO, 2010); 1m² fits 6 crates

⁵⁵ Data based on pictures of <Kohlrabi planted in the crates of participating households

⁵⁶ 3,7 kg per plant; two plants could fit one crate (Hort, 2016)

⁵⁷ over 3-4 months continuous harvesting up to 3kg/ m²; 1m² fits 6 crates (Grubben, 2004)

overall fullness⁵⁸ and satiety⁵⁹ of family members with possible positive implications on alleviating sensations of hunger.

The volumetric measures of harvested crops also play a role in this context. Crops with higher volumetric measures in most cases require less produce (pieces) compared to crops with lower volumetric measures to positively contribute to the fullness of a person⁶⁰.

Relating the data to the volumetric measures of the cultivated crops, it shows that carrots, eggplants, tomatoes, cherry tomatoes, crumps, celery and cucumbers (25% of all crops) hold higher volumetric measures while the remaining crops mainly comprise leaves or other crops of small metrics as garlic or hot peppers (75% of all crops). Thus, those households producing the latter crops, which for example was the case for households with only vertical kits, require much more quantities of produce in their meals to reach the same degree of fullness as households producing the former crops. To conclude, two households with 20% of garden produce on their plates can obtain very differing results for contributions to fullness, satiety and caloric intake.

5.3.4 Increased Access to Fruits and Vegetables, Dietary Diversity and Yields

Access to Fruits and Vegetables

For the increased access to food, more than two thirds (71%) of the participants reported that their access to fruits and vegetables has increased through growing their own produce. Table 15 shows the concrete change in consumption for fruit and vegetables, respectively.

<i>Increased Consumption of Fruit and Vegetables</i>					
<i>Crop Type</i>	<i>Households (hh) absolute and percentage (%)</i>	<i>Purchase pattern of Fruit/Vegetables</i>			<i>Total</i>
		Purchase Increased	Purchase Same	Purchase Decreased	
Vegetables	hh	1	19	8	28
	%	3%	68%	29%	100%
Fruits	hh	-	7	1	8
	%	-	88%	12%	100%

Table 15: Consumption and purchase patterns for fruit and vegetable among households. Source: Authors survey

In total, two thirds (68%) of all participants indicated to consume more vegetables than prior to the project participation. The difference of 3% between increased access and consumption (1 household) could stem from the incident that the household did decide to not consume their produce for unknown reasons.

As of these 28 households, only one household indicated to purchase more vegetables than before, while the rest consumed more vegetables without purchasing more. Thus, the consumed vegetables must stem directly from the gardens. Of the 8 households who spend less money on vegetables, 25% reinvested the saved money in either rice, legumes or bread.

A fifth of all participants (20%) stated to have increased their fruit intake. Increased fruit intake only occurred in households with increased vegetable intake. This is explained by the circumstance, that the only fruit that was grown were strawberries. Thus, no household seemingly only grew fruit and all those who grew strawberries, cultivated at least some vegetables with them in the gardens. When relating these data to the overview of what has been planted among households (Figure 5), it shows that a total of 20 households indicated to have cultivated strawberries, but only 8 households stated to have increased their fruit intake. A possible explanation could be, that quantities of cultivated and consumed strawberries were too small to have been per-

⁵⁸ Fullness is associated with a satisfied feeling in the stomach which turns into an uncomfortable feeling when over-eating (PHL, 2008)

⁵⁹ Satiety is the feeling of satisfaction (not being hungry) that lasts after the initial feeling of fullness has subsided. (PHL, 2008). The caloric density of produce determines the duration of fullness and satiety which can be either long-lasting or more temporary

⁶⁰ The same does not apply for satiety, as for example dates have low volumetric measures but highly contribute to the satiety of a person

ceived by households to notably have affected their fruit intake. The circumstance that strawberries are only harvested for a rather short period of around 2 months of the year could also play a role in this context.

Dietary Diversity

The survey data suggest, that a variety of different herbs/spices, leafy greens and other vegetables were cultivated and thus consumed by members of participating households with the provision of different nutrients. Table 16 provides an overview of the variety of fruits and vegetables cultivated by participants:

<i>Variety of Crops Produced</i>						
<i>Number of different crops within plant type:</i>	<i>Plant groups</i>				<i>Total variety produced</i>	<i>μ of all households</i>
	<i>Herb/Spices</i>	<i>Leafy greens</i>	<i>Other vegetables</i>	<i>Fruits</i>		
	10	7	9	1	27	7,6

Table 16: Variety of Fruits and Vegetables cultivated in the gardens of participants. Source: Author's survey
Categorization of crops into each plant group provided in Annex H; μ=mean

The overall variety of planted fruits and vegetable ranged from 2 different crops per household up to 14 different crops, grown throughout different seasons with an average of 7,6 crops per grown by all households. Two thirds (68%) of all participating households produced between 5 to 9 different crops and only 9% planted less than 5 crops. The variety grown within the plant groups is relatively equal, with exception for fruit. (details on types in Annex H). Reasons for the latter findings is expected to derive from the circumstance, that growing fruit on small scale urban farms is rather difficult. When not cultivated directly into the ground, but instead into crates or plastic bottles, not many fruits are suitable for cultivation. While a considerable amount of fruits grow on orchards, smaller fruit that grow on shrubs as currents or blueberries are not typical for the region. Further, shrubs still take up relatively much space in respect to the size of the crates of participants (compare garden pictures provided in Annex B).

In regard to the overall dietary diversity, taking also in consideration other food groups (dairy/eggs; meat; bread; rice/legumes), the survey results further showed, that in no household the meat and dairy/egg purchase and consumption changed as a result of the project participation. Whereas solely 10% of the participants indicated to consume and purchase more bread and another 7% of the participants consumed and purchased more rice/legumes. Changes in other food groups than fruits and vegetables (bread and legumes/rice) are thus rather minor.

It is assumed, that the households prior to the project mainly consumed staple foods as they are one of the cheapest sources of calories. It is expected, but not certain, that households did consume some vegetables prior to the project. If this was the case, the project did not change the overall dietary diversity of the households as bread and legumes/rice (and possibly vegetables) were most likely already consumed before the project participation. Changes in dairy/egg and meat consumption, more expansive and protein rich foods, did not occur. Fruit was possibly added as food group to some households, if no fruit at all was consumed prior to the project.

The project thus mainly contributed to an increased dietary diversity within the food group of vegetables (including herbs/spices, leafy greens and other vegetables).

Nutritional Value of Produce

Nutrient Composition of Produce:

Table 17 provides an overview of the nutrient value and the daily recommended intake of certain vegetables and fruit that are produced among participating households and contain considerable amounts of the previously mentioned important micronutrients for food insecure households

<i>Important minerals for human health</i>	<i>Rich plant based sources produced by beneficiaries</i>	<i>Amount per cup serving (or piece if indicated) ⁶¹</i>	<i>DV from birth to age of 5 ⁶²</i>	<i>% of DV* of children per cup/piece</i>	<i>Daily recommended intake (DV) adults ⁶³</i>	<i>% of DV* per cup/piece</i>
<i>Calcium</i>	Jew Mallow (cooked) Spinach (cooked)	408 mg 337 mg	200-1000mg	86% 56%	1000 mg	41% 34%
<i>Magnesium</i>	Jew Mallow (cooked) Spinach Basil	130 mg 96 mg <u>62 mg</u>	30-130mg	160% 115% <u>77%</u>	320-420mg	35% 26% <u>17%</u>
<i>Iron</i>	Jew Mallow (cooked) Spinach (cooked)	9,2 mg 6 mg	0.27 mg-10mg	117% 184%	8-18mg	46% 70%
<i>Folate</i>	Spinach (cooked) Jew mallow (cooked) Crumps Lettuce Strawberries	263 mcg 250mcg 170 mcg <u>76 mcg</u> <u>40 mcg</u>	65- 200 mcg	202% 107% 73% 33% 17%	400mcg	63% 65% 43% <u>19%</u> <u>10%</u>
<i>Zinc</i>	Spinach (cooked)	1,4 mg	2-5 mg	40%	8mg - 11 mg	15%
<i>Vitamin A</i>	Jew Mallow Spinach Parsley Carrots (piece) Basil Coriander Lettuce	1000 mcg 943 mcg <u>800 mcg</u> 392 mcg <u>360 mcg</u> 276 mcg <u>264 mcg</u>	400 mcg	250% 235% 200% 98% <u>90%</u> 69% 66%	700 -900 mcg	125% 118% <u>100%</u> 49% <u>45%</u> 35% <u>33%</u>
<i>Vitamin C</i>	Strawberries Parsley Crumps Spinach (cooked) Malfuf Hot pepper (piece) Lettuce	110 mg 104 mg 92 mg 65 mg 60 mg <u>50 mg</u> <u>53 mg</u>	40 mg	275% 260% 230% 162% 150% <u>125%</u> <u>130%</u>	75-90mg	132% 125% 110% 78% 72% <u>60%</u> <u>6%</u>

Table 17: Important micronutrients for food insecure households that are found in certain crops grown by beneficiaries. Author's survey.

Bold written crops are produced by at least 25% of the households. DV=daily recommended intake; *Base value for “% of DV” attained is calculated on behalf of the mean if a value range for the DV is provided

On behalf of the provided values the following estimations were drawn: A cup of chopped basil, produced by half of all households, can meet 78% of the daily recommended magnesium intake for children of the age 1-3 (80 mg). Lettuce and strawberries which were more frequently produced among households contribute at least to 17-33% of children's daily needs in folate when consumed one cup a day. Other important folate sources that were found in the household's gardens are spinach, jew-mallow and crumps.

In regard to vitamins, a half cup of parsley (39% of households) easily covers the DV for children under 5 of Vitamin A and with a whole cup adults can as well cover their DV. While in many countries parsley merely serves as topping of dishes, the Lebanese cuisine highly integrates parsley in bigger bulks, as for example in the traditional Tabbouleh salad, where it constitutes one of the main ingredients. A chopped cup of basil (49% of households) mixed with a cup

⁶¹ <http://nutritiondata.self.com> and U.S. Department of Agriculture (USDA, 2018)

⁶² U.S. Department of Health and Human Services (NIH, 2018)

⁶³ U.S. Department of Health and Human Services (NIH, 2018)

of lettuce (71% of households) can serve to attain the daily Vitamin A need of children under 5 and up to 78% of that of an adult.

For Vitamin C, a quarter cup of strawberries, produce by 49% of households, can fully cover the DV for children under 5 and a third of the DV of adults. Parsley is another important source of vitamin C and less than one cup of lettuce satisfies the Vitamin C recommended intake for children. Important sources of Vitamin C for children but not produced with high frequency among beneficiaries are crumps, spinach and malfuf.

In particular, jew-mallow and spinach stand out for their provision of Calcium, Magnesium, Folate, Zinc and Vitamin A, but most importantly their provision of iron for both children and adults. However, the data indicate, that these two leafy greens were only produced by 17% and 12% of households, respectively. Subsequent projects should thus focus on boosting the production of these crops. This could either be done by providing more seed for these crops or/and educating the households on the importance of iron rich plants for the health of children, adolescent females, pregnant and lactating women.

Nevertheless, of all the households that did produce jew-mallow, 57% had children below the critical age of 5 at the time of the project start, which was the same case for 40% of the spinach producing families. Thus, more than a third (36%) of all households with children under 5 were likely able to provide their children with important micronutrients deriving from spinach or jew-mallow as all of these households prioritized children in food distribution.

Quality of Food:

For almost half (48%) of the households who obtained increased access the fruit and vegetables, the quality of their consumed food also improved. The perceived improved of quality can derive from freshness or from awareness that food does not contain chemical pesticides and herbicides.

As indicated earlier in the study, the quality of fruit and vegetables offered in Lebanon in urban areas, mostly corner-shops or small vegetable shops, is rather low and produce is often at the border of perishing, while the quality in supermarkets can be better but at much higher prices. Studies have shown that increased quality (freshness) of food is associated with higher nutrient values⁶⁴. By consuming produce directly from their garden, the beneficiaries are likely to have positively benefitted from fresher food containing higher nutritional value.

That for 52% the perceived quality of their food did not increase could stem from the circumstance, that many of the grown crops comprise herbs and spices, and might thus not be considered by households to overall have affect their food quality in a notable, positive manner.

5.3.5 Impact of UA on Women

In Figure 6⁶⁵ an overview is provided on the reported positive implications the UA project had on female participants. Most women indicated to have enjoyed the gardening which implies that the activity was overall well received. This circumstance could be of relevance for the following consideration: For some women in developing countries, the gardening activity itself, and not necessarily the food security aspect of it, might be a motivation driver to pick up the activity. Thus, promoting gardening activities to females and mothers as pleasant recreation activity to take a break from the household work (or their job) could be a useful and disguised measure to tackle food security related aspects as for example child malnutrition, as the gardening outcomes (produce) likely will flow into the families. In this context, aid assistance programs could also steer the garden impact towards more vulnerable groups as pregnant women, lactating women, infants and young children by focusing on distributing crops that are especially useful to them.

⁶⁴ Storage and transportation of fruits and vegetables of only a few days can already cause a loss of up to 30-50% of nutritional constitutions (Bellows et al., 2004).

⁶⁵ Corresponding data attached in Table 30, Annex J.

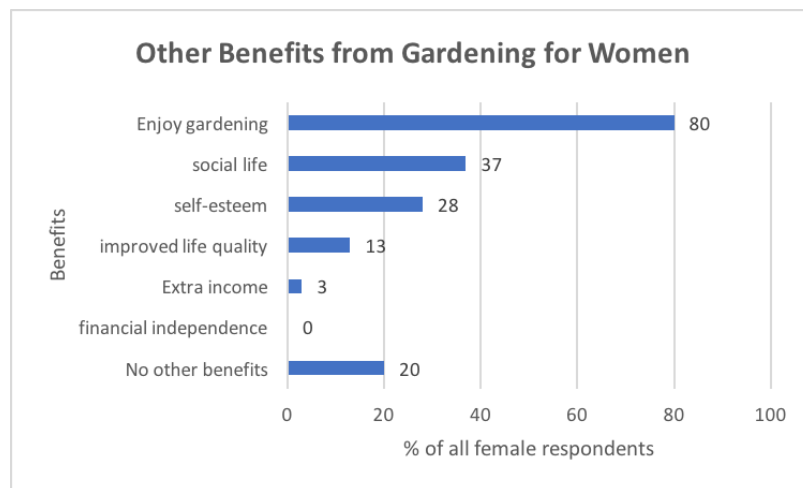


Figure 6: Other benefits experienced by female respondents through their gardening activity besides provision of food or increasing available cash. Source: Author's survey; n=40

The improvements in the social life of more than a third of women could stem from women having made new acquaintances with other Syrian or Lebanese women (project participants) and kept in contact with them. Gardening could facilitate integrating refugees in their host community (or connect them to fellow refugee families) as participants have a common interest and topic on which they can exchange knowledge and experience and by that build social connections in a new environment and strengthen their social capital which can be important for their food security when they run out of food.

For the more than a quarter of women who stated that through the project participation their self-esteem was boosted, for 80% of them the fruit/vegetable access of their households increased and thus the self-reliance of their households and the availability of food. However, this was also the case for 67% of all women who did not feel improvements in their self-esteem. Different reasons could have caused the latter. ESDU reported⁶⁶, that many women during the first household's assessment visits showed great enthusiasm to be producing their own food. It could be, that participants might have had higher expectations than the actual output provided. While this is only a theory, project initiators should be aware of the attainable outcomes of a project based on provided resources and other influencing factors and raise only realistic expectations among participants in regard to potential yields etc.

These findings would also correlate with finding on types of cultivated crops, as many herbs/spices and leafy greens were produced that are not necessarily contributing to an improved satiety, caloric intake and fullness of household members. However, nutrients deriving from this produce might be still very important and positively affecting family members, but might have been not considered by women due to a possible lack of awareness. Other reasons why women did not increase their self-esteem even though the fruit/vegetable access increased, could also be linked to the personality of a person (positive or negative self-image) or their overall psychological condition, as among the Syrian beneficiary's women might suffer from post-traumatic conditions or depressions caused by the war.

Only one household managed to generate income with selling produce (a female participant), which did not increase the woman's financial freedom from her husband, who in that case was the head of the household. According to the results, financial independence from the head of household was not increased through the project participation.

Only one household managed to generate income with selling produce (a female participant), which did not increase the woman's financial freedom from her husband, who in that case was the head of the household. The households that saved some food expenditures should also be considered in that respect. However, none of the women experienced increased financial independence from their husbands in that cases either. Reasons could be that the financial contribution was rather minor or husbands adhered to rigid hierarchal orders. If latter was the case, the

⁶⁶ Was mentioned as „opportunity“ in ESDU's monitoring reports

increased self-esteem would thus not have translated into positive implications on the women being more successful in claiming their share of revenue.

Further, only a rather minor number of women reported to have obtained an overall better life quality through their urban gardening activity. This could be another evidence, that the amount of food provided through the UA and the amount of saved expenditures were rather minor.

5.3.6 Urban Agriculture for Economic Resilience

Generating Income

Besides producing food for their own consumption, the beneficiaries were also taught in the workshops how to add value to their produce if they wish to sell it (light packaging, adding herbs to olive oil, drying herbs etc.). The results showed, that 10% (4hh) of participants intended to sell their produce. Of these four households, 75% showed to be not successful making profit as they indicated that generated income either equaled their additional expenses (packaging, oil, bottles etc.) or the expenses even outweighed the income leading to a loss. Possible reasons for the relatively small number of participants deciding to sell their produce could be that the households preferred to use their gardens to stock up on their consumption of fresh food instead of selling it and buying more staples. They might have also not been able to afford value adding material as oil or packaging. Lacking market opportunities for selling produce, either with added value or in their “raw” version, could be another reason, as small corner shops selling fruits and vegetables are plentiful in Beirut and they might not felt able to compete. In case of the Syrian participants, the circumstance that they are restricted when it comes to the labor market could also be a reason as they might fear breaking rules or getting evicted when selling something on the streets.

When asking the concerned households how they reinvested the money possibly made with their commercial activity, the one household that was able to generate income stated to have reinvested it in food.

Reducing Expenditures

Of all households, 39% indicated to have reduced their expenditures with growing their own fruits and vegetables. Table 18 provides information how money was reinvested:

<i>Reinvested Cash Made Available Through Home-Production of Food</i>						
<i>Money reinvest in:</i>	<i>Food</i>	<i>Non-food items</i>	<i>Debts</i>	<i>Savings</i>	<i>Remittances</i>	<i>School fees</i>
<i>Of all households in %*:</i>	24%	15%	2%	2%	0%	0%

Table 18: Overview on how saved expenditures were reinvested. Source: Author’s survey.

*Sums up to more than 39% as multiple answers were possible.

In total 61% of the households claimed that they could not reinvest money as the impact of the gardens did not allow them to reduce their expenditures. Among all households, 19% invested in vegetables, 10% in bread, 7% in rice/legumes and 2% in fruits⁶⁷.

The incident that buying food came before other needs (non-food items, debts, saving) could have occurred for two reasons: either the cash made available from lowered expenditures was very little and not sufficient to cover a notable share of rent, school fees etc., or the most pressing need of refugees and host communities is increasing their food intake. In the latter case it would be assumed, that buying foods that are calorie dense (staples) are preferred over other foods. However, two aspects provided by the data would rather support the first theory. First, many of the 61% of participants that did not increase their cash availability made use of the open answer option provided at the end of the question and it was repeatedly expressed that “the money was not enough for anything”⁶⁸. However, among these participants 56% still increased

⁶⁷ Percentages sum up to more than 24%, as some households reinvested in multiple food group

⁶⁸ this translation serves to express and comprise slightly differing answers by participants that all expressed the same experience, other expressions used were “money not enough for something” or “not enough for anything” etc.

their fruit and vegetable intake. It is thus in question, if the 39% of all households that increased their cash availability achieved results that immensely differed from their fellow project participants, as they cultivated under mostly similar conditions (weather, garden kits, workshop input). Second, fruits and vegetables are relatively cheap⁶⁹ in Lebanon compared to other foods as for example dairy. However, this does not translate into deprived households easily accessing them, as with very low income they might still be out of reach as caloric denser staples are likely preferred to feed all household members.

In view of the produced crops, of which many are herbs, spices and leafy greens, widely available and comparatively cheap in Lebanon, the overall value saved by producing these crops at home is estimated to be relatively low when the values are set in relation to much higher overall living costs in the capital, as rent or other non-food needs. In a comparison of cities regarding their cost of living index, Beirut ranked before the Canadian metropolis Vancouver⁷⁰ and the third highest among 20 Arab cities⁷¹.

5.4 Findings on Lessons Learned

5.4.1 Survey Results on Challenges and Opportunities

Seeds and Fertilizers

The survey results showed, that half of all participants (53%⁷²) had problems affording seeds or fertilizers which corresponds with the findings that 59%⁷³ of households live under US \$4 per person per day. As it was projected that households would not have much cash available to invest in gardening resources, the project was set out to enable participants to raise their own seeds or seedlings which they were taught during the work-shops.

However, the circumstance that most participants repetitively asked for more seeds during the monitoring visits⁷⁴ indicates, that a one-time seed distribution was not sufficient. The participants are likely to require more time to acquire the skills and experience to raise their own seeds and seedlings. To overcome such constraints, similar projects should plan to distribute seeds more frequently during the implementation phase and to integrate a special agenda for deployed trainers, which supervise the participants, to monitoring the participants progress and abilities to raise their own seedlings and if necessary plan more workshops on that specific topic to enhance capacities over time.

Further, slightly more than a third of households (39%⁷⁵) had problems finding seeds or fertilizer. Participants might not have had problems finding seedlings or fertilizers in general but certain types they were looking for in their area. A possible support from the project side could be to provide lists or support to participants where (certain) seeds can be found in surrounding areas or by linking them to urban farmer's markets so that they can get in contact with farmers to access certain seeds that might not be easily available and found in urban areas.

Further, the focus should be directed to increase the potential of the gardens to cover micronutrient deficiencies. A baseline study with a food recall could serve to identify which micronutrients are likely undersupplied among the target group, or define the target group based on their deficiency in certain micronutrients. On base of that, projects could specifically promote and provide seeds that are suitable to tackle the specific missing micro-nutrients. As example, for household's that are low in Vitamin A, posing risk to their eye sight and their immune system, UA could be a beneficial approach as dark green leafy vegetables are good sources of Vitamin A (WHO, 2018; Krawinkel&Müller, 2005) For household's low in iron, crops with high levels of iron as spinach, swiss-chard or broccoli would be of importance in their gardens. Combining

⁶⁹ but often of poor quality

⁷⁰ Cost of Living Index, produced by crowd-sourced global database Numbeo www.numbeo.com

⁷¹ According to the Byblos Bank "Lebanon This Week" economic report <https://www.byblosbank.com/ContentFiles/6605PDF.pdf>

⁷² Total response rate to this question n=39

⁷³ Total response rate for income on which poverty lines are calculated n=37

⁷⁴ Information drawn from the ESDU monitoring reports. A summary of all challenges and opportunities is provided in Annex F.

⁷⁵ Total response rate to this question was n=38

these crops with growing Vitamin C rich plants, that are suitable for UA, as tomatoes, further increases the ability of the body to absorb the available iron when both foods are consumed together (Cook&Reddy, 2001). Providing participants with nutrition education would be crucial in such approaches. Crops suitable for UA being rich in zinc and contributing to more than 10% of the daily recommended intake per cup cooked are for example beans, spinach, lentil sprouts or green peas. Vitamin C rich foods are bell peppers, cauliflower and certain herbs, brussels sprouts and green leafy vegetables as kale or spinach. Magnesium rich sources that could grow in small gardens are spinach, seeds from squash or pumpkin and lima beans while calcium can be obtained from beans and lentils, some leafy greens as kale or spinach and rhubarb. For folate, leafy greens, asparagus, broccoli, beans, peas and lentils should be considered.

Irrigation Water

For access to water almost two thirds of the households (61%⁷⁶) did not always have sufficient. This corresponds with the fact that water in general becomes very scarce from around April to October and that the water supply system in Beirut is tremendously lacking capacities. Water scarcity is an issue that is hard to address. The engineers that developed the garden kits of the project already took this in consideration and designed the vertical kits in a way that aimed for water efficiency⁷⁷ and also allowed to catch surplus water for reuse at the bottom.

However, it is estimated that there is more potential to catch and store rain water, as only one participant applied this method. Precipitation during fall and winter is relatively high in the region. Lacking storage material might be a reason why this method was not applied more often. While big tanks are already used by many household to store fresh water, these are often pre-installed or taken over from the previous renter and households might not be able to afford to buy additional units. Sufficient space to place more tanks solely dedicated for rain water collection might be a constraint.

Satisfaction Rates of Participants

In Table 19 the results regarding the participant's expectations with their garden results are provided:

<i>Participants Satisfaction</i>					
<i>Expectations of participant:</i>	<i>exceeded</i>	<i>met</i>	<i>not met as not able to produce aspired amounts of F/V</i>	<i>not met as not able to produce aspired types of F/V</i>	<i>not met as it was expected to profit more financially</i>
Households absolute ⁷⁸	0	12hh	23hh	7hh	7hh
(hh) and in %	0%	29%	56%	17%	17%

Table 19: Satisfaction of participants with their UA outcome⁷⁹. Source: Author's survey

That less than a third of participants were satisfied with their project outcome shows, that there is much potential for improvement. Main aspects in this regard were participant's not being able to produce aspired amounts of food. This could be a result of limited planting space or the reported lack of water and input can result in a wide yield gap⁸⁰. Increasing the skills of participants to achieve higher yields could also be a possibility. In this regard an assessment could be undertaken a couple of months after the kit distribution to examine the skills of the farmers and the state of the gardens, also taking in account the available resources, to estimate which partic-

⁷⁶ Total response rate to this question n=39

⁷⁷ A blueprint of the vertical kits are provided in Annex C. The vertical kits were made of a wooden frame that holds up to 40 plastic bottles of 2L volume. The bottles are cut at one end and arranged below each other in rows, which grants water economy as only the upper bottles must be irrigated. The result is a dripping water cascade to the lower bottles.

⁷⁸ Households absolute sum up to more than n=41, as multiple choices were possible

⁷⁹ Other reasons than the listed were stated by 10%/3hh of participants: "I could not continue because there was no water", "I did not benefit from anything" and "I had problems with the renter".

⁸⁰ The difference between the maximum yield of a crop under optimal conditions and the real yield

ipants would benefit from receiving additional training sessions that provide input that surpasses the advice of the frequently visiting trainers.⁸¹ The findings that some participants were not able to produce the kind of crops wanted could be related to the findings, that certain seeds could not be found by participants or that the specific plants were not growing due to hot weather or high demand for irrigation water. That 17% were not satisfied as they expected to achieve higher financial gains could be another indicator, that refugees and not necessarily start urban gardening with the main objective to generate income or saving a great share of their food expenditures⁸² but rather to have an additional source of food.

Determinants of Satisfaction

To elaborate on influences on participants having met their expectations, the ability to increase the fruit and vegetable intake of a households is estimated to be the major determinant. This showed to apply for all households that were satisfied (100%), but only for 50% of those whose expectations have not been met. A finding that is highly conclusive, as all households (100%) stated that they entered the project with the intention to produce food for their own consumption.

While only 16% of satisfied households attended more than one workshop, the share among unsatisfied households was in contrast two-fold (34%). Further, a quarter (25%) of satisfied participants brought previous gardening experience into the project, however, the rate of unsatisfied households was only by 6% lower. Thus, attending more than one workshop seemed no to be decisive, nor did previous garden experience. Both findings could derive from the aspect that the participants were constantly consulted and supported during the implementation phase by the trainers, which were also in contact with the agricultural engineers in case of queries and problems with the gardens.

In Table 20 and the satisfaction of respondents is set in relation to the garden kit installed in the household.

<i>Satisfaction and Garden Kits</i>				
<i>Garden Kit within Household (hh)</i>	<i>Expectations of participant:</i>	<i>met</i>	<i>not met as not able to produce aspired amounts of F/V</i>	<i>not met as not able to produce aspired types of F/V</i>
Horizontal Kit (n=16)	hh absolute and %	8hh	4hh	4hh
		50%	25%	25%
Vertical Kit (n=4hh)	hh absolute and %	0hh	3hh	1hh
		0%	75%	25%
Both Kits (n=21)	hh absolute and %	7hh	11hh	3hh
		33%	52%	15%

Table 20: Expectations of participants set in relation to gardening kit of households

The households that only owned vertical kits represent the greatest share of households that were not able attain the desired amount of produce. These findings are comprehensive, as the plastic bottles do not allow to grow other crops than herbs, spices and some of the leafy greens. Further, the aspect that none of the households with vertical kits met the expectations of the participants does confirm the assumptions previously made in the section *Share of Produce Covering Meals of Household's*. It was projected that households with only vertical kits likely

⁸¹ As the trainers learned their skills from several training sessions but do not hold a degree or certified proficiency in agriculture.

⁸² Based on assumptions considering the data on how increased cash was reinvested, as no household payed school feed or rent with it and only 2% were able to pay off debts or save it up

could not add to fullness and satiety of household member as they can only grow crops of very low volumetric measures.

Thus, it would be recommended, to at least always provide some crates along with the vertical kit. This might not always be feasible, depending on the available space of a household. In such cases, the participants should be well informed prior to starting their urban garden on the potential production capacities of the vertical kit to avoid unrealistic expectations and disappointment.

Concerning household's being unsatisfied with the kind of produce they were able to cultivate, the best results were achieved by the combined kits (only 10% not satisfied). This reinforces the recommendation, to always try to install a combination of both kits, if the space allows to do so.

Satisfied household's production showed to be more diverse, as they cultivated on average 9,9 plant types, which was by 3,6 types lower among unsatisfied households. Resilience might play a role on the positive side. If a certain crop did not provide good yields due to pests or diseases, there were likely still other crops in the garden to be harvested not affected.

Figure 7⁸³ shows a comparison of frequency of fruits and vegetables cultivated among satisfied and unsatisfied households.

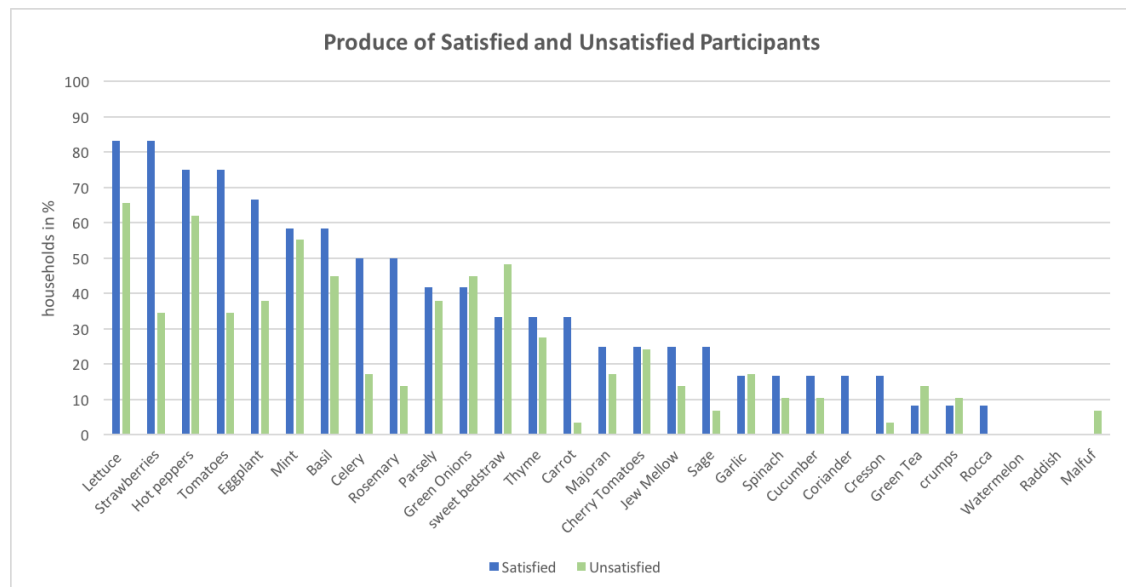


Figure 7: Comparison of frequency of vegetables/fruit produced among satisfied and unsatisfied households. Source: Author's survey

Among the most commonly planted crops were lettuce, hot peppers, mint, strawberries, tomatoes and eggplants. The frequency of cultivation of the three latter crops was two-fold among satisfied households compared to non-satisfied households. As quantities of the produce were not captured, the contribution of strawberries, tomatoes and eggplants to higher satisfaction levels remains based on assumptions. However, these findings would, again, support the assumptions, that produce with higher volumetric measures positively contribute to a person's fullness level, which could be likely linked to higher satisfaction with the garden outcomes.

Summing these findings up, according to the results a greater diversity of cultivated crops, mixed kits were received better, likely due to more planting space and scope to arrange different crops, and crops with higher volumetric measures as these have higher potential to positively contribute to the fullness and satiety of a meal.

In contrast, the number of attended workshop seems not to have influenced the satisfaction of participants, same as bringing previous gardening experience.

⁸³ Corresponding data attached in Table 29, Annex J.

Continue Gardening and Recommending UA

Interesting were the findings, that 76% of participants plan to continue with their garden activity even though the number of satisfied participants was much lower (29%). All participants who planned to continue would also recommend urban gardening to friends or neighbors and an additional 4% would recommend it even though they do not want to or can not continue themselves.

These findings indicate, that while participants desire improvements in terms of production types, planting space and/or input resources, the gardening project itself was well received. This could be for the advantage of growing one's own food and perceiving to be more self-sufficient, simply enjoying the garden activity as distraction or recreation or other factors might have played a role that have not been captured in the survey

5.4.2 Further Findings on Challenges and Opportunities

Restrictions to use rooftops

A note challenge by ESDU were restrictions by the house owners or land-lords of potential beneficiaries to install gardening kits on rooftops. It is difficult to overcome these kind of limitation, however, if the capacities allow, project managers could try to directly direct landlords to explain the intention of the project and possible positive outcomes for the participants in regard to food security and health. In cases where children are part of the (potential) beneficiary family, the importance fresh produce can have on child development could be emphasized or the focus could be laid on the economic aspect, as urban gardening can improve the financial situation of a household and thus make them more reliable renters. Another option could be for households without access to gardening space, to evaluate if community gardens can be set up where they can garden with other households, for example on roofs of commercial buildings

Target Group

Findings from the ESDU reports revealed during assessment visits, that often the poorer and thus more vulnerable households did not have a balcony (and could not access the rooftop). These households were not able to participate in the project. This bared the great risk, that the most vulnerable households that could benefit the most, are excluded from the outset. In this regard the question rises, how the target group should be defined of urban agriculture projects. The survey results suggest, that a minimum of financial means among households are necessary that can be dedicated to the gardens, to keep them going on the long run (water, seeds etc.) If very poor households invest their extremely scarce financial means into inputs, but fail to succeed with their gardens for various reasons, such projects could have further strain their financial means with no outcome. It should thus be investigated further, with which minimum prerequisites potential participants should dispose to not risk to deteriorate their current condition by participating in UA projects.

Special Features of Refugees as Project Participants

A problem that was noted, specifically related to integrating refugee families was, that they were more unstable in terms of their accommodations. Families dropped out of the project as they were leaving the country or moved within the city or country. It lies in the nature of being a refugee that unforeseen changes occur, as better paid jobs are found somewhere else, income conditions worsen or many other reasons that cause families to change their residence. Such implications can hardly be predicated in advance, neither by the project managers nor by concerned households. However, a possible way could be to conduct an assessment prior to integrating households into the project to identify the motivation of participants and the likelihood that they will stay in the area on behalf of their situation.

Planting Seasons

Most of participant's who stopped gardening within the first weeks remarked, that their plants were exposed to sun, wind or birds that harmed their plants. They also reported to not have had

sufficient water which led the garden dry out. It is likely that the latter responses came from the participants who had their kit installed during the first round of kit installations at the end of May/early June when the weather can be already very hot in Beirut. As a result, it would be recommended to not have the participants start their gardens during the hottest months of the year but rather in more temperate months of early spring or fall. The combination of low gardening experience, hot weather and water scarcity increase the chance of failure and participants might lose their motivation and stop gardening. In contrast, starting planting during milder seasons provides the opportunity to harvest a first set of produce which comes with a sense of achievement, that can motivate participants to pick up gardening long-term, even if they might have some shortfalls or pauses during the next summer season when resources become too scarce. Another possibility would be to introduce drought tolerant crops, however, in such cases it must be ensured that on long-term participants would be able to access these crops or have the skills to raise their own seeds and seedlings from them to avoid donor dependency.

*Expansion of Vertical Kits and Negligence of Vertical Kits*⁸⁴

On behalf of the pictures of the gardens taken by the interviewers during the survey sessions showed that some households had expanded their gardens by adding on units, often in the form of re-used round plastic buckets. Pictures of the gardens are provided in Annex B. This shows that participants used the opportunity to expand their gardens for low or no cost and recycle material that otherwise would have added to the waste of the city that is often not properly taken care of. On the other hand, the pictures also captured vertical kits that are completely abandoned and unused. The state of some kits (Annex B) suggests that this is not due to a seasonal planting pause. A possible reason could be that the vertical kits might not have received sufficient insolation or participants abandoned them to focus on their horizontal kits.

Based on these findings, strategic interventions are suggested to overcome noted challenges to obtain optimal gardening results and which special preconditions should be laid and to what must be paid increased focus and attention when aiming to address certain target groups with aid programs based on UA. An overview is provided in Table 21 which also displays opportunities that should be considered to gain the most potential of UA.

1. Target Group: All		
Required preconditions: - Space on rooftop or balconies that allow to place horizontal gardening units, at least 1,5-2 m width and minimum total space of 2 sq. m ⁸⁵ and permission from landlord to use the space for UA (Exception: target group 1.1) - Potential beneficiaries anticipating to not change their housing in the near future, at least for the next 12 months ⁸⁶ - Moderate access to irrigation for most time of the year		
Challenges	Risks	Solutions
Scarce water resources	Plants can dry out which reduces yields or complete loss of harvest, both may be resulting in dwindling motivation of participants and no impact on food security or economic resilience can be expected	Provision with material to collect and safely store rainwater and increase emphasis of importance of grey water recycling for irrigation during workshops

⁸⁴ Information based on a field visit of one garden by the author and pictures provided by trainers during conducting the surveys

⁸⁵ Would allow for up to 12 crates of a size of 45cmx30cmx15cm which ensures a minimum of garden outputs and space to grow a wider diversity of crops (if inputs available and sufficient)

⁸⁶ Allows household's to grow for several seasons which increases possible benefits on food security or economic resilience while participants can pick up enough skills to possibly continue gardening in their new home independently

Participants not being able to find certain seeds/seedlings	Participants are not able to produce aspired crops	Participants could be equipped with a list/overview of stores/places where they can access to seeds/seedlings in a reachable distance or connect them to urban farmer's markets to collaborate or connect them to rural seeds banks
Participants in need for more seeds/seedlings	Participants attain low yields or can not continue with their gardens	Looking for seed funding or planning more financial means to distribute seeds/seedlings more frequently. Donor support is important but donor dependence must be avoided, thus, at the same time increase efforts to strengthen skills of farmers to raise own seeds/seedlings
Hot summer months	Risks desiccation of plants, losing motivation of participants and no impact on food security or economic resilience can be expected	Avoiding starting the project during the hottest seasons or depending on the magnitude of heat introduce drought tolerant crops or or introduce saline-tolerant crops ⁸⁷ (if relevant), protect plants from too much insolation (depends also on plant types, advice participants to grow plants that prefer shade in the same crates so that crates can be placed separately/protected if space allows)
Low yields	Low impact on food security and no surpluses are created that could be sold	Identify trigger and adopt solutions as for example usage of plant varieties adapted to city conditions as for example short corn that produces four instead of two ears ⁸⁸ or introduce saline-tolerant crops (if relevant), assess the skill level of the farmers and add additional education sessions on farming techniques to increase capacities
Opportunities:		Positive Implications:
Workshops that comprise a hands-on practical composition besides imparting theoretical knowledge		Participants get familiar with gardening kits and can start gardening right away after reception of their kits
First workshops well in advance before distribution of garden kits which holds potential to find more beneficiaries through word-to-mouth		Facilities outreach and saves costs
Pre-test garden kits with a third party and subsequently with small pilot groups of beneficiaries		Ensures that the kits are productive and manageable/maintainable by beginners
Train participants how to produce their own non-chemical fertilizers, pest controls and on bigger plots also herbicides		Ensures better quality of produce with less health risks and spares cash of participant's

⁸⁷ Crops more resistant to saline water which is useful in cases when irrigation water is saline (EEA, 2015), as it can be the case in coastal areas as Beirut where tap water is saline. This condition is further exacerbated during summer months as ground water tables sink and sea water intrudes.

⁸⁸ Royte, 2015

Use relatively simple garden kits that allow participants to add on units by themselves	Results in no cost or very low cost to expand garden and can at the same time foster environmental benefits through upcycling/recycling of material	
Utilization of garden kits that are adapted to water scarcity	Spares scarce resources (water) and can contribute to higher yields	
Teach participants how to raise their own seedlings/save seeds	Facilitates independent continuation with gardens and thus increases sustainability and longevity of project outcomes	
<p><u><i>1.1 Target Group: Household's with no access to balcony/rooftop</i></u> <i>Objective: Avoid exclusion of most vulnerable household's or household's that highly fit a defined target group</i> <i>Special attention should be drawn to:</i></p>		
<i>Challenges</i>	<i>Risks</i>	<i>Solutions</i>
Most vulnerable households tend to not have a balcony or space to garden	Highly vulnerable population is left behind	Set up community gardens can be set up, for example on roofs of commercial buildings
House-owners do not allow to use rooftop for gardening	Loss of participants that would have fitted a defined target group	
Household's highly lacking access to basic inputs as water	Loss of participants that would have fitted a defined target group	
<i>Opportunities:</i>		<i>Positive Implications:</i>
Community gardens would enable households to share garden components that are too expensive to be provided for projects where each participant cultivates on their own rooftop/balcony, as for example sun-driers that are relatively cost intense per unit		Add value to produce to increase the market value or conserve it for storage
Supervision of gardens and participant's gardening skills facilitated which allows for timely intervention in case of yield decreasing threats as diseases or evidence of desiccation of plants that might not be noticed by beginners		Higher yields
<p><u><i>1. 2 Target Group: Household's with members having certain micronutrient deficiencies or being especially vulnerable to micronutrient deficiencies as children under 5, pregnant or lactating women or adolescent girls</i></u> <i>Objective: Increase availability of deficient nutrients by enabling households to grow crops rich in required nutrients which increases their food security and decreases prevalence of malnutrition</i> <i>Special attention should be drawn to:</i></p>		
<i>Challenges</i>	<i>Risks</i>	<i>Solutions</i>
Low or no concentration of relevant nutrients provided by crops	Not addressing and improving micronutrient deficiencies	Supply household's foremost with seeds that contain considerable amounts of the relevant micronutrients with paying attention to the bioavailability ⁸⁹ of nutrients of the selected crops

⁸⁹ The bioavailability of a nutrient can be defined as its accessibility to normal metabolic and physiologic processes. Bioavailability influences a nutrient's beneficial effects at physiologic levels of intake (DRI, 2006)

Opportunities:		Positive Implications:
Using workshops to disseminate important nutrient intake related information as nutrient preserving cooking practice, daily recommended intake or minimum consumption threshold to achieve improvement or educated how to increase the bioavailability of nutrients by combining certain crops in a meal		Improving adequate micro-nutrient intake and absorption
<p><i>1.3 Target Group: Household with high prevalence of underweight</i> <i>Objective: Increase availability of calories by enabling households to grow caloric dense crops which increases their food security and decreases prevalence of underweight and hunger</i> <i>Special attention should be drawn to:</i></p>		
Challenges	Risks	Solutions
Low caloric potential of crops	Reduces the potential of gardens to alleviate hunger and underweight of participants	Develop kits that also allow to grow crops with higher caloric values as increasing the depth of crates to grow certain tubers
<p><i>1.4 Target Group: Participants intending to sell their produce (partly or entirely)</i> <i>Objective: Increases income of households which contributes to alleviating poverty, increasing food security, increasing household's resilience through (additional) income source and reduces dependence on aid programs</i> <i>Special attention should be drawn to:</i></p>		
Challenges	Risks	Solutions
Produce is not sufficient to generate income or surpluses	Losing the opportunity to create a (additional) livelihood which could contribute to economic resilience of household and losing the opportunity to increase self-reliance away from food aid	Increasing training, technical advice and extension support or facilitate start-up capital to increase access to inputs
No or low means to add value to produce	No value adding or costs for value adding inputs (oil, wrapping et.) surpass profit	Facilitate start-up capital to increase access to value adding inputs
Not succeeding to sell their produce	Frustration and loss of income opportunity	Support to increase market access by extensive advice with sales, marketing, processing and preserving food and an examination which crops are suitable for local markets in regard to input costs vs. market value
<p><i>1.5 Target Group: Female's not being the head of the household</i> <i>Objective: Increase intra-household decision making of women and providing women with a livelihood/source of income to increase food security and economic resilience of household's</i> <i>Special attention should be drawn to:</i></p>		

<i>Challenges</i>	<i>Risks</i>	<i>Solutions</i>
Produce is not sufficient to generate income	Losing the opportunity to create a livelihood for women and providing them with an income which could have positively contributed to the economic resilience and food security of the household as women invest 10 times more of their income to the well-being of their family, including child care, health ⁹⁰ and nutrition ⁹¹	Increasing training, technical advice and extension support or facilitate start-up capital to increase access to inputs
Not succeeding to sell their produce	Frustration and loss of income opportunity	Support to increase market access by extensive advice with sales, marketing, processing and pre serving food and an examination which crops are suitable for local markets in regard to input costs vs. market value
<i>Opportunities:</i>		<i>Positive Implications:</i>
Increase self-esteem of women		Can reduce hierarchies within households through possibly increasing their dominance in claiming saying over household's resources which can be beneficial for food security of households ⁹²
Gardening is enjoyed by women		Can be used to (e.g.) indirectly tackle child malnutrition by promoting gardening activity as pleasing recreation activity from housework or job

Table 21: Strategic interventions to enhance the outputs of UA and obtain optimal results for certain target groups

In total five different target groups were defined and their special needs in regard to support and inputs emphasized. For the first target group (1.1), it is suggested to combine it with another specific target group to increase the effectiveness of the project. For example, a project could be set up that seeks to address women not being the head of the household (target group 1.5) who all lack access to rooftops/balconies (target group 1.1).

In cases where participants are likely to face the same challenges even though the overall objectives are somewhat different (for example target group 1.4 and 1.5), these target groups could be merged into one project to benefit from synergies of many common basic components (garden kits, basic technical skills) which, however, still allows to add on some tailored components to each target group. For other target groups setting up individual programs might be more efficient, as in case of target group 1.2 and 1.3 possibly completely different crops might be of relevance to achieve the objectives which likely also affects the required basic components as design of the kits and training sessions with overall low potential to profit from synergies.

⁹⁰ health can be a precondition necessary to increase food security

⁹¹ Duflo, 2012

⁹² Duflo, 2012; Hovorka, 1998

5.5 Discussion

5.5.1 Discussion Research Questions 1-5

RQ1 - Food Security

The findings, that 83% of participating households suffer to some degree of food insecurity provides clear evidence, that food insecurity is still widespread among Syrian refugees and vulnerable host populations. It corresponds with the official numbers provided by UNHCR and UNICEF, where 91% of refugees are projected to be food insecure in 2017 (VASyR, 2017). The estimations for the Lebanese population revolve around 15%-20%, possibly higher (IFI, 2014). The deviating results of the survey on the Lebanese population (83,3% food insecure) indicate, that the project did succeed in targeting the right households among the host population. The overall results also align with the results of the research conducted by Abollahi et al. (2008) on Afghan refugees in Pakdasht, Iran, where 88% showed to be food insecure. In contrast, food insecurity showed to be much lower among Syrian refugee in four provinces⁹³ in Turkey with one-third of the surveyed population being food insecure (WFP, 2016c). A possible explanation for that could be, that different Syrian social classes sought refuge in different countries, regulations of border politics can also play a role in that regard.

In regard to the aims of the project, the intention⁹⁴ of the UA project was to involve both refugee and hosting families of poor areas, that are unable to provide themselves with enough food and thus do not meet the required amounts of daily food intake. This can be resumed to have been achieved, as Syrians and Lebanese were integrated in the garden project and households of both nationalities show to belong to the vulnerable members of their populations according to the results on their food security and poverty status.

Thus, referring to *RQ1: What is the prevalence, severity and duration of food insecurity among participant's households?* it can be concluded, that participant's households are highly prevalent to food insecurity, more than two thirds affected by the severest form⁹⁵ in a chronic condition.

RQ2 - Food Availability and Calories through UA

In total, for 68% of all household's fresh produce, mainly vegetables, were made available through UA. Fruits are estimated to have played a minor role for most household's, as only one sort was grown.

The findings are somewhat lower compared to the findings of Gallaher (2012), as in the Kibera slums in Nairobi, a total of 88% of the farmers stated in a follow-up survey that their gardens provided them with extra food.

Comparing the data of the UA participants to the four case studies of Prain&Dubbeling (2011), the data are only slightly lower than the findings in Accra (71%) and Lima (73%) and deviate only by 4% to the mean of all four cities (64%)⁹⁶. These findings imply similar potentials for UA among different cities in different countries and regions of the world.

Early monitoring reports of the pilot project with multi-storey gardens carried out in Ethiopian refugee camps (Wtsadik, 2009) showed that in the three different project sites 75%-100% of surveyed population had started to harvest vegetables. A reason why the outcomes were higher in this pilot project could lie in the circumstance, that these refugees exclusively relied on food aid and were not able to pursue income generating activities. While most participants in the UA project also did not contribute to their household's income, at least one adult family member was occupied with generating income. Thus, in the Ethiopian case more human resources was available to be directed towards the care taking of the gardens which might have led to better results.

⁹³ Gaziantep, Hatay, Kilis and Sanliurfa

⁹⁴ ESDU, 2015

⁹⁵ The severest form of the USDA 6-item Food Security Module

⁹⁶ Accra, Lima, Bangalore, Nairobi

For additional calories provided to the families the data on cultivated produce indicated that 70% of cultivated crops provided less than 30 kcal per serving⁹⁷. However, half of the crops belonging to the latter group were only cultivated by small numbers of households (12-17%). The study by Mwangi (1995) in Nairobi disclosed that urban farmers (also being part of an UA project) were significantly better off in energy and protein consumption than non-farming households.

For the households of the UA project in Bourj Hammoud, the data suggest that the households producing food with moderate caloric provision could possibly⁹⁸ show slight improvements for calorie intake compared to households of the area not farming. In contrast to the Nairobi farmers, rearing livestock, which provided additional calories through fat and protein, was not part of the UA project in Bourj Hammoud. Further, the main crops cultivated among the African farmers were maize and beans, which both provides much higher⁹⁹ calories per serving than the crops grown among the urban farmers in Lebanon.

However, the households of the Nairobi farmers still were not able to meet their required daily food intake (calories). The findings that 83% of households of the UA project in Bourj Hammoud remain food insecure and thus do not meet occasionally or frequently their daily food intake (calories), aligns with the findings of Mwangi. It further corresponds with the results of Yeudall et al. (2007), who found that there was no significant difference in household food security scores among farming and non-farming households even though UA contributed to a significant greater availability of kilocalories (kcal) from own produce for the children of livestock and crop farming households than non-farming households.

In regard to yields, it was outlined in literature, that these are highly influenced by factors as climate conditions, availability of land/surface and quantity and reliability of water sources. Participants showed to face challenges regarding hot weather in summer months combined with scarce water resource which likely impacted their attainable yields. The planting space was flexible for the horizontal kit owner, while the ones with vertical kits were much more limited in what they were able to grow and resulting yields.

Brown and Jameton (2000) advocated, that a 10mx10m plot can provide the yearly vegetable need of a household. In average, the households with horizontal kits had 6 crates, which results in a planting space of 0,9 mx1,80m (1,62m²) which accordingly would not suffice to provide a whole family with enough vegetables over the course of a year. In this context FAO (2016c) projects that 1m² can provide either around 200 tomatoes (30 kg) per year, 36 heads of lettuce every 60 days or 10 cabbages every 90 days or 100 onions every 120 days (FAO, 2010) or in total 20kg of food a year. Calculating this down to the households with an average of crates, a garden should be able to provide around 2,7 kg¹⁰⁰ of produce per month. For households that grew crops with higher volumetric measures as carrots, eggplants, tomatoes or crumps, such projections are estimated to be realistic. For vertical kits owners and households that mainly grew herbs, spices and leafy greens, such results likely were not attained.

For the share of the main meal covered with home produced food, half of participants (51%) attained a coverage of 20%. These findings are supported by the results of two different studies, one in Nairobi (Mwangi, 1995) and one in Dar es Salaam (Sawio, 1993), where urban farmer's households managed to produce a quarter of their food requirements in their own gardens.

In Zimbabwe, in contrast, 25% of the low-income urban farmers achieved to cover two thirds of their food consumption with own produce while in the UA project in Bourj Hammoud only 10% of beneficiaries achieved a coverage of maximum 40%. The latter result likely is a direct result of the overall nature of produce cultivated among households, as overall the greater share of cultivated crops were minor in calories and volumetric measures, possibly combined with limited yields due to hot weather and water scarcity.

To sum these findings up in regard to *RQ2: Do the urban gardens increase the availability of food and calories among participant's households?* for at least two thirds of household's the availability of fresh food increased. However, the caloric potential of most crops was rather

⁹⁷ cup or tablespoon

⁹⁸ depending on the actual attained yields and number of family members that shared the produce

⁹⁹ 210 kcal per cup boiled; 206 kcal per cup cooked beans (USDA, 2018)

¹⁰⁰ 1,62 m² would after FAO provide 32,4 kg produce per year

minor which leads to an estimated overall relatively low impact on alleviating underweight or decreasing hunger.

RQ3 - Increased Fruits and Vegetable Intake and Dietary Diversity

In total, two thirds (68%) of all participants indicated to consume more vegetables¹⁰¹ than prior to the project participation and 20% stated to have increased their fruit intake. These data are comprehensive with findings of the peer review by Korth et al. (2014) that presented a positive correlation between UA and increased vegetable and fruit consumption.

Regarding vegetable intake, the findings are somewhat lower than in Cagayan de Oro, Philippines, where 85% of urban farmers daily consumed vegetables (Potutan et al., 2012). The data on the study region revealed, however, that vegetables were so widely available as they were grown in many farm plots and backyards. The participants of the UA project in Bourj Ham-moud, were in general more limited in space available as they planted in relatively small crates and bottles and might have faced more input constraints, as lacking water, which possibly enabled less households to increase their vegetable intake.

In regard to the incident that fruits were not dominant among households, the main reason for that is expected to derive from the circumstance that most fruit are not necessarily suitable for the dimensions of the UA project, as many grow in orchards and shrubs might have taken up too much space of the crates or are not typically grown in the country.

The results on the farmers of the Kibera slums in Nairobi, showed similar outcomes, as farmers significantly more frequently consumed green leafy vegetables than non-farmers while they only marginally significantly more frequently consumed fruits (Gallaher, 2012).

Gallaher found in addition, that even though farmers significantly more frequently consumed green leafy vegetable, there was no significant difference found among farming and non-farming households in overall dietary diversity. It showed that farmers of the study who were able to generate money from selling their produce bought more of already consumed food groups, as for example maize flour, instead of entering a new food group as meat or fish.

The results of the survey of the UA project also suggest, that the overall dietary diversity of the households did not change compared to prior to the project, presuming they occasionally already consumed some vegetables and fruits. However, as the average households grew an average of 7,6 crops the project is expected to have contributed to an increased dietary diversity mainly within the food group of vegetables, namely a diversity of herbs/spices, leafy greens and other vegetables. In the four cases studies of Prain&Dubbeling (2011), farmers in Lima showed significant differences in levels of consumption of leafy vegetables and orange-fleshed vegetables (like carrots, squash, sweet-potatoes) than non-farmers. Further, in Bangalore very poor farmers and non-farmers diversified their diets (referring to food groups) which could have been the same for the most deprived participants of the UA project, if they were not consuming vegetables or fruits at all before the project.

Increased dietary diversity, be it the number of food groups or within a certain food group, helps to ensure an adequate intake of the various essential nutrients needed by the human body. According to the results, only five crops¹⁰² were grown more frequently among beneficiaries that can have notable positive contributes to the provision of Vitamin A and C, Folate and Magnesium. Crops that can potentially contribute to Calcium, Zinc and Iron intake, however, have not been frequently cultivated.

The findings of Korth et al. (2014) also showed, that even though UA and increased vegetable and fruit consumption of the studied cases, it was in no case positively or directly linked to improved levels of nutrition. Same occurred for the four case studies of Prain&Dubbeling, as farmers of three of the four cities showed significant differences between the nutritional status of producers and non-producers

Positive findings of the UA project were the results that more than a third (37%) of all households with children under 5 were growing spinach and jew-mallow, that might have positively

¹⁰¹ including herbs, spices, leafy greens and other vegetables

¹⁰² Basil, Lettuce, Parley, Strawberries and Hot Peppers

influenced the iron intake of these children, presuming that yields were adequate and the overall health status allowed for proper absorption of nutrients. However, the overall available evidence does not suffice to allow for the assumption that the UA project in Bourj Hammoud had an equal impact as Maxwell's et al. (1998) findings in Uganda, where children under 5 of urban farmer families, showed a significant lower prevalence of stunting and being underweight than non-farming families.

In regard to *RQ3: Do the urban gardens contribute to increased fruit and vegetable intake and increased dietary diversity among participant's households?* The data suggest that more than two thirds of participants increased their fruit and vegetable intake, including herbs and spices. The data do not suggest that that dietary diversity, measured in number of food groups, consumed did change. However, the dietary diversity measured by variety within food groups did increase as households on average consumed 7,6 different crops, which consisted mainly of a variety of herbs, spices, dark leafy greens and other types of non-starchy vegetables.

RQ4 - Impact of UA on Women and Effect on Household's Food Security

The results of the survey have shown that UA that it was well-received among the female participants and a notable share stated to have experienced improvements in their social life (37%) and their self-esteem increased (29%) while the contribution to contributions to improved quality of life and extra income¹⁰³ were minor. The results align, at least partly in regard to self-esteem, with those of the gardening project in the Dheisheh refugee camp near Bethlehem. Women there reported to have gained self-esteem, experienced relieve of stress and increased life satisfaction through their successful work (Karama, 2013). The micro-gardening project by Kenyan refugee camps (Corbett, 2009) also reported, that participants improved their general well-being along with increased self-reliance and empowerment of women.

In literature, it was remarked, that women are much more likely to direct generated income towards the well-being of their families, as in nutrition or education (Duflo, 2012). This study does not provide evidence to support or conflict these findings, as increased cash is expected to have been rather minor while increased financial independence from the head of the household was not achieved. Thus, it can not be assumed that the female participants gained saying in how the cash was reinvested. However, it should also not be assumed, that all women of the project inherently do not have any saying in how the household's money is spend. The data do show, that the money was mainly reinvested in food, likely because it did not suffice for most non-food items as rent or school fees. In cases where women make joint decision with their husband's, they still might have bought food that are sought to be especially beneficial for their children, likely specific vegetables as the purchase of protein rich foods did not increase. This would be supported by the findings, that almost all households preferred their children in regard to intra-household food distribution, and not the head of the household.

For *RQ4: What impact does gardening have on female participants? What are possible positive implications from that for the food security of their households?* it showed that more than two thirds of female participants improved their social life which can enhance social safety net of the family. Financial independence from the head of households was not reported while the self-esteem with possible positive implications in claiming their saying within the household which can increase their empowerment over allocating the household's resources and might have positively influenced feeding and care practices for children which both contribute to food security.

RQ5 - Reducing Expenditures and Generating Income

According to the results, 39% of showed to have been able to reduce their food expenditures to some degree. However, the available data suggest, that these savings were likely rather minor. Comparing this to findings from literature, it shows that the percentage of households being able to reduce expenditures in the UA project was lower than in the four case studies assessed by Prain&Dubbeling where the following numbers of reduced expenditures among surveyed households were presented: Bangalore 56%; Nairobi 70%; Lima 73%; Accra 80%. Reasons for that are most likely that the study of Prain&Dubbeling builds its findings on samplings from

¹⁰³ Refers to income from selling produce

intra-urban, peri-urban transition and peri-urban areas for each of the four cities. Thus, it is highly likely that these areas include surfaces that provide more space for growing crops than the (on average) 6 crates and 16 plastic bottles of the participating households.

Possible reasons why only 10% (4hh) of households attempted to generate income with surplus food may also be drawn from literature. The case of the IDP camp in Uganda (Radice, 2005) showed, that 75% of beneficiaries showed interested in selling surplus produce, however, only under the premise, that the project would be expanded. This indicates, that vulnerable participants, tend to first supply their households with garden produce and only when their needs (of fresh produce) are saturated, turn towards generating income with surplus produce. This aligns with the findings, that not one of the 4 households of the UA project exclusively intended to sell produce, but in all cases, it was planned to consume the produce and to sell it. Two learnings can be deduced from this. First, the low rate of 10% can derive from the circumstance that refugees see gardening foremost as opportunity to self-provision of food. Second, produce must first surpass the household's needs to play a potential role in generating income for families, which was not the case for the beneficiary households.

In regard to how saved or generated income was reinvested, the results showed in both cases food came before other needs. Two reasons were assumed for that: either the cash made available from lowered expenditures was very little and not sufficient to cover a share of rent, school fees etc. or the most pressing need of refugees and host communities is increasing their food intake. However, the latter would be contradictory to the circumstance that vegetables (lower nutrient values) were preferred over buying staple food (with higher calorie density).

Comparing these findings to literature, in the cases of Bangalore, Nairobi, Lima and Accra corresponding results were found, as it showed that in three cities the share of urban farmers stating "*UA saves money for food purchases*"¹⁰⁴ was around two-fold to those stating "*UA saves money for other purchases*"¹⁰⁵ with a mean of 70% of households for the former and 37% of households for the latter response (Prain&Dubbeling, 2011). Regarding into which food groups money was reinvested, staple foods came before vegetables, which was not the case for participants of the UA project in Bourj Hammoud¹⁰⁶. Prain&Dubbeling argue, that these findings might origin in the circumstance that staples could not be produced by the urban farmers themselves, in contrast to vegetables which were more widely available through the gardens.

In regard to the UA project in Lebanon, it is estimated that staples already make up the greatest share of food consumed by the project participants, mainly accessed through their food vouchers as those are the cheapest and most calorie-dense food sources found in corner-shops and supermarkets¹⁰⁷. Further, the gardening activities of the beneficiaries took place on rather small surfaces (crates and plastic bottles), producing mainly herbs, spices, leafy greens and some more caloric dense and filling produce. As stated in the previous paragraph, vegetables/fruits surpluses were most likely not created by the urban gardens. Subsequently, it is concluded that the gardens did not oversaturate the participants needs for fresh produce and therefore money likely was not reinvested in buying staples but in more vegetables to additionally cover their needs for fresh produce.

Interesting in this context are results by several scholars, who found that even extremely poor people do not seem to be as hungry for additional calories as one might expect (Banerjee&Duflo, 2006). Deaton and Subramanian (1996) reported in 1983 in Maharashtra, India, that in terms of calorie density, millets were the cheapest choice. However, only about two-thirds of the total spending on grains of poor households were directed towards these cheapest grains, while 20% were invested in rice (which costed more than twice as much per calorie) and a further 10% was spent on wheat (which was a 70% more expensive way to get calories). Further, around 7% of the total budget of the poor was spent on sugar, being more expansive than grains and lacking nutritional value. Similar results were found by Banerjee & Duflo (2006), as in Udaipur, India, 16% of the food budget of very poor households was spend

¹⁰⁴ Accra (84%); Bangalore (56%); Lima (73%); Nairobi (69%); (Prain&Dubbeling, 2011)

¹⁰⁵ Accra (56%); Bangalore (29%); Lima (34%); Nairobi (36%); (Prain&Dubbeling, 2011)

¹⁰⁶ 17% of households invested in staples and (or in addition) 21% in vegetables/fruits.

¹⁰⁷ Food vouchers can only be redeemed in supermarkets and corner shops (if they cooperate with the WFP)

on sugar, salt, cooking oil and other processed foods. They also found, that among extremely poor, for every 1 percent increase in food expenditures, around half of the percent were used to buy more calories while the other half went into more expensive and better tasting calories. These findings could explain why the expenditures on staples and vegetables were almost equal among project participants.

For *RQ5: Did cash availability of households increase through their urban garden activity? How did the participants spend this extra cash?* it can safely be concluded that generating income through selling garden produce did overall not contribute to increased cash availability among household's while, however, reduced expenditures through own production did. The food was mainly reinvested in food which was followed by non-food items. Needs as saving up money to have financial backing, paying rent, paying school fees paying were not addressed with the increased cash or by a negligible share of household's.

5.5.2 Validation of the Research Framework

Bringing the findings of Research Question 1-5 together with the research framework of this study will allow to evaluate the accuracy of the framework in regard to the conditions provided by the UA project in Bourj Hammoud.

For the *Environmental Context*, the climate of Bourj Hammoud is with around 300 sunny days per year (Sheehan, 2008) suitable for urban agriculture, however, summer days can get very hot and hamper plant production. In combination with that water scarcity in summer is widespread which puts additional pressure on urban gardening activities. Beirut also has very high levels of air pollution, especially during the summer months, which might pose risks to the quality of cultivated crops. The same applies when participants attempt to expand their gardens and take soil from surrounding areas, as pollution within the city is widespread and soil might be contaminated.

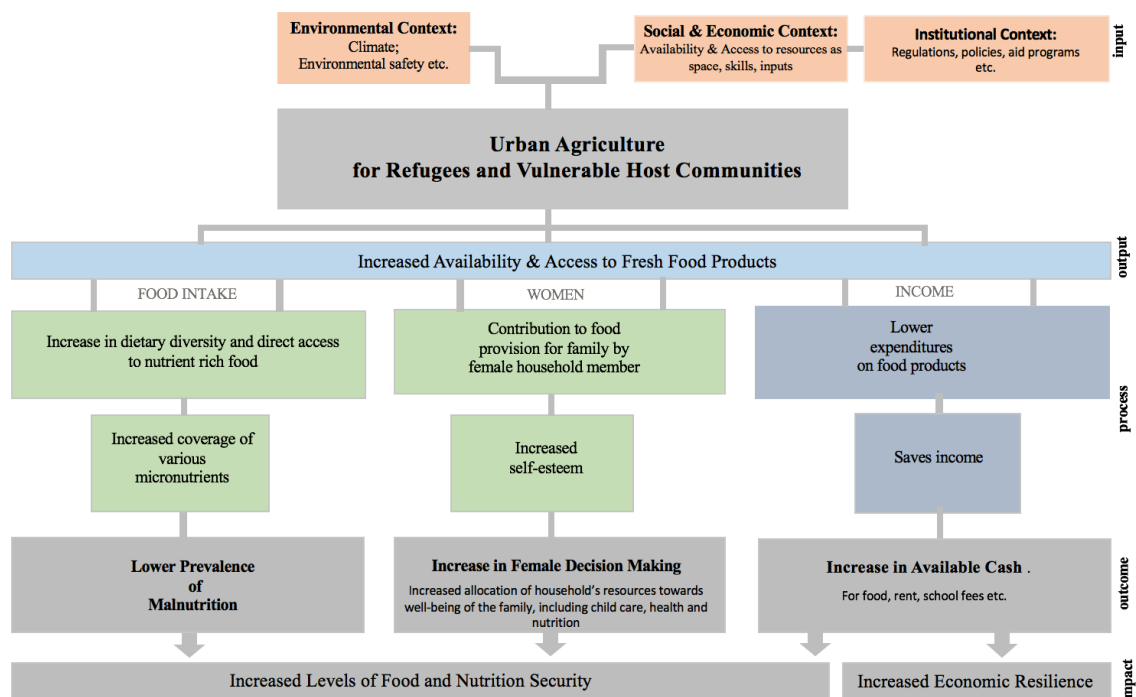


Figure 8: Research Framework of the study adapted to the findings of the survey. Sources: Author's survey; Korth et al, 2014

In regard to the Institutional Context, no restrictions for planting crops in urban areas are implemented, however, there are also no suitable policies and strategies in place that would promote urban gardening by official Lebanese authorities. The project was an aid program which provided most of the necessary inputs for participants, thus, highly influencing the Socio & Economic Context. While the space and water available depended on each household, the gar-

dening skills and further inputs as gardening kits, soil and starter seeds/fertilizer were provided. Support through the institutional side would also be needed to increase the potential of the gardens to generate income, as household's need to be equipped with means to increase production and add value to the produce. Based on the findings for Research Question 1-5, the Research Framework of this study has been adapted to the findings of the survey and is illustrated in Figure 8. All three sections, FOOD INTAKE, WOMEN and INCOME have each been reduced to one main path, the one that was supported through the findings of the survey. For the women section, the findings on improved social life increasing the social safety of household's net for periods of food shortages has not been added as the evidence of the survey did not suffice to lead the findings on improved social life back to acquaintances with other participant's. Further, it is not sure if new acquaintances would be willing to share food or are able to. The developed Framework on Urban Agriculture for Food Security and Vulnerable Host Communities serves as a guide on what to expect for projects carried out under relatively similar basic preconditions. Removed elements could likely be added back on, if certain foundations are laid in advance.

5.5.3 Research Question 6

RQ6 - Lessons Learned

Common constraints among participants was the lack of certain inputs and not meeting their expectations in regard to yields and types of crops cultivated.

Findings from literature showed¹⁰⁸, that water scarcity is a common problem for micro-gardens for refugees/IDPs as they are often located in arid or semi-arid regions. In the case of the sack garden project in Ethiopia, where water was also reported to have been very scarce during dry seasons, UNHCR tried to encourage refugees to re-cycle waste water from showers and washing food (Wtsadik, 2011).

In regard to the garden kits, which highly influence what and how much can be grown, a key finding from FAO (2017) in conjunction with a rural micro-garden project in Lebanon for refugees was, that the simpler the structure of the garden kits, the better the success rate of the micro-gardens. These findings would support the findings of the UA project, as the data suggested that the vertical kits, which are more complex in their structure, were not able to compete with the horizontal structure.

Overall it can be concluded in regard to *RQ6: What are the lessons learned from the project?* that accessing basic garden inputs can already represent a major constraint to some households with expected negative implications on their yields. Hot seasons aggravate this issues, especially in regard to water availability. The selection of the garden kit plays a major role in regard to which crops can be cultivated and which yields can be achieved. Thus, target groups and related objectives should be more specified (tackle underweight or micro-nutrient deficiency, provide additional income source etc.) to increase the potential for impact of the project. Based on the needs of a target group the garden kit should be developed, relevant seeds provided and additional input sessions held that might in some cases need to surpass capacity building on basic gardening skills.

¹⁰⁸ FAO, 2017; Wtsadik, 2011

6 Conclusion and Recommendations

High dependence on food assistance, limited access to income and uncertainties on the amount of food aid provided in the upcoming year all contribute to an unstable and low food security status of Syrian refugee households in Lebanon.

A total of 1.395.000 Syrians and 580.000 vulnerable Lebanese are estimated to be affected by some degree of food insecurity, while currently only around 50% and 10% of the concerned population are supported by the WFP and partly by joint efforts with the Lebanese government (FSCluster, 2017). These numbers are clear evidence that current efforts of providing food assistance are not sufficient to combat the repercussions of the crisis and get the situation under control. Sustainable long-term solutions are needed that increase self-reliance of refugees. Enabling a household to grow its own food was the basic assumption of this study to contribute to achieving this goal. In how far this applies for the project evaluated in this study will be displayed by summing up the key findings and providing recommendations both for the study area and further afield.

6.1 Conclusion

The aim of this study was to investigate the contribution of the urban agriculture project in Bourj Hammoud to the food security and economic resilience for Syrian refugees and their vulnerable Lebanese host communities with the objective to build a base of knowledge and to provide recommendations for stakeholders on how to improve for similar projects in the future.

In regard to achieving the proposed objectives of this study, it can be reported that:

(I) Evaluate the impact of the project on beneficiary households:

a) Assess the state of food security among the project participants

The results showed that participant's households are highly prevalent to food insecurity, more than two thirds affected by the severest form in a chronic condition.

b) Identify effect of project on food and nutrition security of participants' households

For at least two thirds of household's the availability of fresh food increased. However, the caloric potential of most crops was rather minor which leads to an estimated overall relatively low impact on alleviating underweight or decreasing hunger. Further, more than two thirds of participants increased their fruit and vegetable intake, including herbs and spices. The data do not suggest that that dietary diversity, measured in number of food groups, consumed did change. However, the dietary diversity measured by variety within food groups did increase as households on average consumed 7,6 different crops, which consisted mainly of a variety of herbs, spices, dark leafy greens and other types of non-starchy vegetables. Further, the gardening activity increased the self-esteem of more than a quarter of women with possible positive implications in claiming their saying within the household which can increase their empowerment over allocating the household's resources and might have positively influenced feeding and care practices for children which both contribute to food security.

c) Identify impact of the project on economic resilience participant's households

Generating income through selling garden produce did overall not contribute to increased cash availability among household's while, however, reduced expenditures through own production did. The food was mainly reinvested in food which was followed by non-food items. Needs as saving up money to have financial backing, paying rent, paying school fees paying were not addressed with the increased cash or by a negligible share of household's.

(II) Determine factors that can improve similar projects in the future

Basic garden inputs can already represent a major constraint to some households with expected negative implications on their yields. Hot seasons aggravate this issues, especially in terms of water availability. The selection of the garden kit is crucial role in regard to which crops can be cultivated and which yields can be achieved. Both factors determine the potential in addressing certain objectives as decreasing malnutrition or cultivating crops with good value to be sold on local markets. Thus, target groups and related objectives should be more specified in advance (tackle underweight, tackle micro-nutrient deficiencies, provide additional income source etc.) to increase the potential for impact of the gardens. Subsequently the garden kits should be developed, relevant and climate adapted crops selected and provided and additional, target group specific input sessions held that complement sessions on basic gardening skills.

Based on these findings, it is concluded that the potential of the project has not been exhausted yet. Instead of seeing this as failure it proposes much more a field of opportunities. The study results have provided sufficient evidence to safely state that many participants were enabled to sustain an urban garden even though most of them had never practiced gardening before and equally important, the activity was enjoyed by most of the urban farmers while many pursue to continue. Not for everyone who endures dire conditions in the form of food insecurity and poverty picking up gardening might be perceived as promising or appealing approach to alleviate their situation. Gardening requires continuous commitment and care taking which can not be imposed on people but must be driven by internal motivation, too. Thus, the basic foundations have been laid and can now be built on.

With the opportunity comes the challenges to adapt and improve this or similar projects by considering the lessons learned from this study and by consulting the recommendations provided in the next section to reach into the full potential urban gardening has to offer, as disclosed by literature.

With currently 124 million people (FSNI, 2018) suffering from food insecurity evoked by crisis, efforts must be directed towards ensuring that all these people whose food security is threatened by living in protracted crises and war are not left behind which is crucial to eradicate hunger and move towards achieving the SDG's.

6.2 Recommendations

Several actions must be pursued to establish a base for the implementation of certain mitigation measures and to further enhance the current situation. To find solutions for the variety of revealed challenges it is essential to operate on several levels. Learning from obstacles faced by the staff and participants of the UA project in Bourj Hammoud can enable to tailor the curriculum for future programs in a way that the programs achieve greater impact on participants.

The following ten recommendations are derived on base of the study's findings and provide a holistic multi-level solution approach by addressing the research level, the political level, as well as the entities that design and implement aid programs based on urban agriculture:

Research Level

Strengthen accurate data base on the scale of UA:

A vast variety of case studies on urban agriculture and its impacts are found in literature. However, the state of the art of the evidence base on its impacts remains scarce and thus should be further strengthened. Systematic, long-term studies and data collection must be conducted to measure attainable contributions in qualitative and quantitative regard to justify financial support.

Best practice and safe low-tech solutions:

A second area for research is to widen the data pool on safe and sustainable technological practices for urban agriculture in developing countries. Which technologies and production units provide the best gardening outputs (yields) in regard to very limited space, which ecological farming practices are most feasible and/or affordable for low-income participants, how waste and waste water can safely be transformed into crucial gardening resources without posing

health risks to the applicant.

Policy and Institutional Level

Creating an enabling policy environment:

The government should formulate a national urban agriculture policy which would both recognize the importance of urban agriculture and encourage it while at the same time ensuring that its dangers are known and addressed. Urban agriculture could be integrated into national food security policies or food aid programs of aid organizations to facilitate access of low-income and vulnerable host and refugee communities to technical assistance and extension programs. Further, the government and/or aid organizations should establish a well-functioning credit or voucher service that enables the target population to receive or borrow funds for starting or boosting crop production. Many urban farmers are women, thus, described aid schemes and extensions programs should, also, be specifically designed for females, to efficiently reach the right target group.

Efficient collaboration:

There is the need to for close and efficient collaboration between national governments, municipal authorities, aid organizations and civil society actors for the sake of reducing food insecurity among local host populations and IDP or refugee communities. Through adequate national urban agriculture policies, the government can guide and direct the design of urban gardening. This paves the way forward for involved stakeholders as governments, universities, local NGO's or CBO's to allocate and combine their resources and most efficiently work towards a holistic goal.

Project Design

Integrate Nutrition Education:

Scholars have noticed, that increased income and food availability through urban agriculture at the household level do not necessarily go hand in hand with improved nutrition outcomes. It is therefore recommended, to integrate nutrition education in UA promoting programs to increase the potential for successful outcomes. This can be done by developing capacities of urban agriculture practitioners/program beneficiaries in regard to health and nutrition education. Depending on the region and socio-demographic background of beneficiaries, illiteracy rates must be considered and learning material adapted. Creating and providing participants with easy understandable, graph based handouts on nutritional values of crops and optimal food preparation and care practices, can help to sustainably ensure best distribution and use of harvested crops among household members, including changes in maternal and child feeding habits.

Promoting adequate crops:

To guarantee the best nutritional outcomes, also in conjunction to the suggested nutrition education, the cultivated crops play an important role. Specific actions should therefore be taken, to promote and especially provide seeds of crops that contain high levels of nutrients that are notoriously lacking among food insecure households or a project's specific target group. Selected crops with high value of vital nutrients, should in addition be suitable for the climate conditions of the project area.

Adopting to water scarcity:

Scarce irrigation water is one of the major challenges for poor households. Countermeasures must be considered and integrated the outset of the project development. Gardening units should be designed to most efficiently use water and catch surplus irrigation water for reuse, emphasizing the importance of rainwater collection and provision of storage material, encouraging households to use grey water and integration of drought tolerant plants.

Carefully choosing the implementation period:

It is highly recommended to start planting during the moderate seasons of the year (Lebanon early spring March-April or fall October-November) to avoid that hot weather and lack of water result in severe crop shortfalls, that potentially stifle the initial motivation and enthusiasm of beneficiaries with the risk of losing interest in garden activity.

Enhancing procedures on measuring effectiveness:

A major challenge when the impact of UA based on yields.

Measuring the garden outputs and yields in long intervals, for example annual, can be very challenging as different seasons provide different quantities and types of crops and surveys based on participant's memories and estimations can result in inaccurate data. It is recommended to routinely collect data on consumption and produce to reliably review and monitor the effectiveness of interventions.

Annex A: MSGs project in Ethiopian refugee camps

Camp	K/Beyah	Awbarre	Shimelba
No. of beneficiaries (households) surveyed	40	45	43
No. (%) who developed MSGs	37 (91%)	39 (93%)	43 (100%)
No. of sacks developed by beneficiary	1 sack (0%)	1 sack (2%)	1 sack (2%)
	2 sacks (2%)	2 sacks (11%)	2 sacks (7%)
	3 sacks (5%)	3 sacks (28%)	3 sacks (5%)
	4 sacks (7%)	4 sacks (20%)	4 sacks (7%)
	5 sacks (70%)	5 sacks (28%)	5 sacks (70%)
	6+ sacks (7%)	6+ sacks (4%)	6+ sacks (9%)
No. (%) beneficiaries have started to harvest vegetables	30 (75%)	36 (80%)	43 (100%)
No. (%) beneficiaries who have sold vegetables	0 (0%)	2 (4%)	6 (14%) Average income 31 Birr/month
No. (%) beneficiaries eaten eggs	Chickens are still small/too immature to lay eggs and breed	Chickens are still small/too immature to lay eggs and breed	15 (35%) Average 7.5 eggs eaten per week
No. (%) beneficiaries who have recycled water	31 (77%) Average 71.2 litres/week	28 (62%) Average 79 litres/week	32 (74%) Average 146 litres/week

Figure 9: Data on micro-garden project in Ethiopian refugee camps carried out in three different sites. Source: Wtsadik, 2011

Annex B: Pictures of Project Gardens

Well Maintained Gardens



Well Maintained Gardens

Gardens Not Well Maintained or Affected by Sun/Diseases/Water Scarcity

Annex C: Data on Project Gardens

Vertical kit: This kit consists of a double wooden frame: 2m Length, 1.5 m Width, 2 cm Thickness with thick chicken square mesh (coated wire). The frame has hooks in order to be hanged on the wall, and its upper corners are made of solid wood. This kit can include up to 40 big plastic bottles of 2L volume, depending on the size of the crops to be planted. It is light in weight and can be moved if desired; it can be hanged on a wall or a window. It can be very aesthetic and used to hide old walls and/or as a “wind shield”. The bottles are easily replaceable in case one is broken (ESDU, 2015).

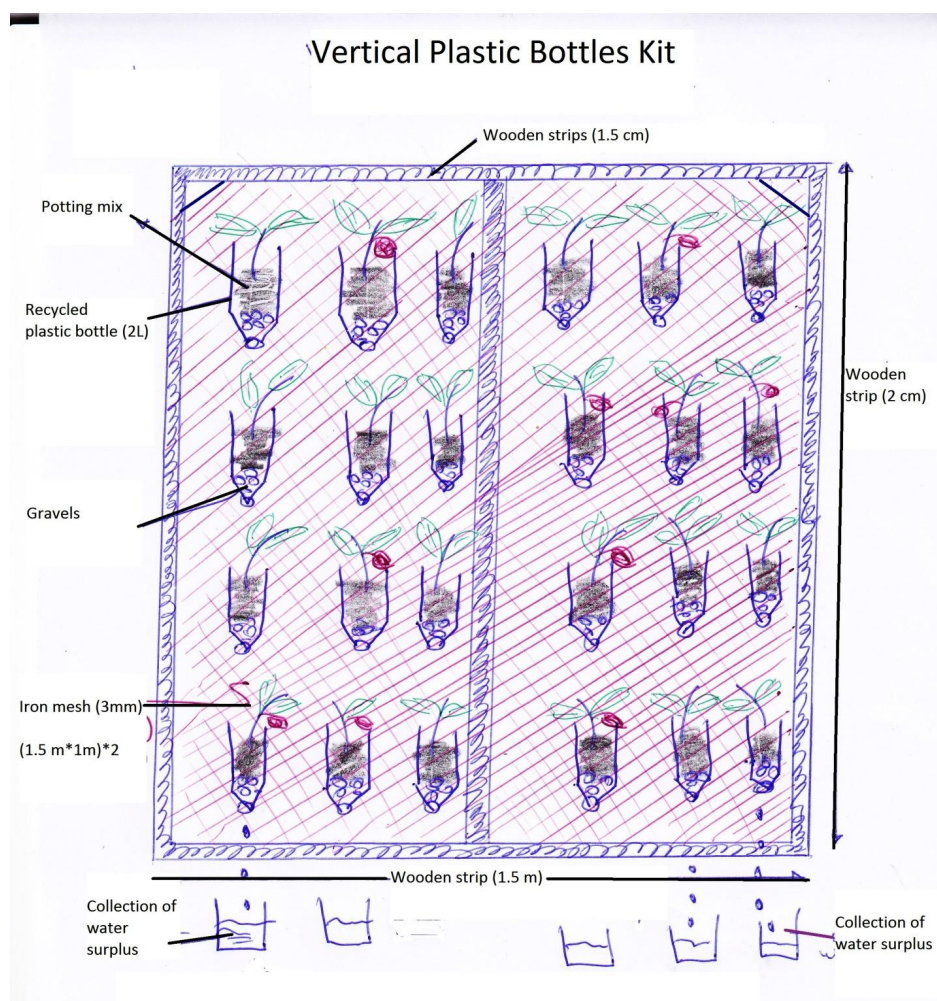


Figure 10: Draft vertical kit. Source: ESDU, 2015

Horizontal kit: The horizontal plastic crate can be used on a balcony or a rooftop. It is easy to maintain and to use. All crops can be grown in this horizontal kit, and trellises are easily installed when planting climbing plants such as cherry tomato, beans, etc. the shape and structure of the crate allows good drainage hence normal growth of the plants roots and avoids water asphyxiation. Regarding the sustainability and replicability of using this system, participants can increase the size of their “garden” by getting used plastic crates, if they don’t have enough financials to buy new ones (ESDU, 2015).

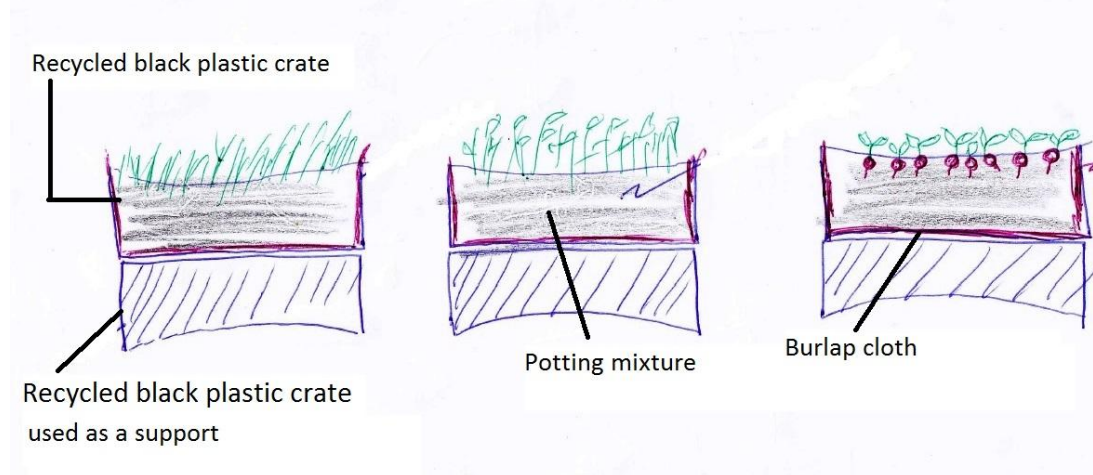


Figure 11: Draft horizontal plastic kits. Source: ESDU, 2015

Composting Unit: Each composting unit consists of a plastic crate to be placed on the balcony or the roof-top. Household food leftovers and garden waste (if available) will be used to make compost.

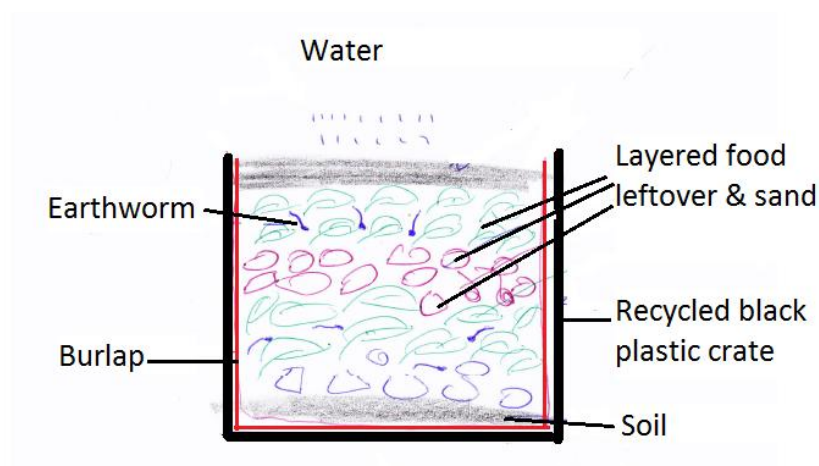


Figure 12: Draft composting unit. Source: ESDU, 2015

Beneficiary Selection Criteria (ESDU, 2015)

- Participants with roof access are available given a priority
- Participants with roofs that are maintained, in order to avoid leakages and other problems are given a priority
- Individuals with plantations on their balconies will be given priority since they already show interest in gardening
- Individuals with previous experience in agriculture are given a priority
- Willingness to follow trainers' guidance
- Good house conditions (no cracks in the floor, no leaks, with barriers to prevent accidents etc.) are given a priority
- Priority to sun exposure (for improved plant health)
- No high exposure to wind are given a priority
- Willingness to make contribution (ensure the plastic bottles, transport the kits from distribution spots to their houses)
- Water availability
- The roof inhabitant, has the priority to work on the roof, whereas the other building inhabitant can have their units on their balconies

Yields calculated for horizontal kit:

Estimated economic value of the produced crops

"Building the Food Security and Economic Resilience of Syrian Refugees and Vulnerable Members of their Host Communities in Beirut/Lebanon"

Type of Crop	Time to maturity (1st harvest)	Harvest (when mature)	Planting time	Growing Season	Average number of Harvests	Average yield (bunches) per crate/harvest	Average price(LBP)/Unit	Approx. Revenue (LBP)/Harvest	Approx. Total Revenue (LBP)/crate/season
Dandelion	seedlings: 1 month	Every 15 to 20 days	seedling: October	October to March	12	6	LBP 2.000,00	LBP 12.000,00	LBP 144.000,00
Swiss Chard	seedlings: 1 month	Every 15 to 20 days	seedling: October	September to March	12	6	LBP 2.000,00	LBP 12.000,00	LBP 144.000,00
Celery	seedlings: 1 month	Every 15 days	seedling: October	September to February	12	6	LBP 2.000,00	LBP 12.000,00	LBP 144.000,00
Lettuce	seedlings: 2 months	once	seedling: October	September to November	1	8	LBP 1.500,00	LBP 12.000,00	LBP 12.000,00
Green Onions	bulb: 20 d	Better once	bulbs	Can be grown all Year round	12	4	LBP 2.500,00	LBP 10.000,00	LBP 120.000,00
Green Garlic	bulb: 20 d	Better once	bulbs	Can be grown all Year round	12	7	LBP 2.500,00	LBP 17.500,00	LBP 210.000,00
Coriander	seeds: 1 month	Every 20 days	seeds: February	February to April	5	7	LBP 500,00	LBP 3.500,00	LBP 17.500,00
Rocca	seeds: 1 month	Every 20 days	seeds: February	February to April	5	10	LBP 500,00	LBP 5.000,00	LBP 25.000,00
Mulukhiyah	seeds: 1 month	once	seeds: March	March to May	1	1 kg of green leaves	LBP 8.000,00	LBP 8.000,00	LBP 8.000,00
Parsley	seeds: 1 month	Every Month	seeds: January	Can be grown all Year round	12	5	LBP 500,00	LBP 2.500,00	LBP 30.000,00
Cherry tomatoes	seedlings: 2 months	Harvest mature fruits	seedling: April	April to September	Harvet mature fruits	800g/plant/4plts	LBP 1.500,00	LBP 6.000,00	LBP 24.000,00
Sweet Peppers	seedlings: 2 months	Harvest mature fruits	seedling: April	April to September	Harvet mature fruits	1kg/plant/4plts	LBP 2.000,00		LBP 8.000,00
Hot Peppers	seedlings: 2 months	Harvest mature fruits	seedling: April	April to September	Harvet mature fruits	400g/plant/8plts	LBP 2.000,00		LBP 32.000,00
Okra	seeds: 1.5 month	Day after day when mature	seeds: April	April to July	Day after day	300g/plant/12	LBP 4.000,00		LBP 14.400,00
Cucumber	seedlings: 2 months	every 2 days	seedlings: May	May to September	every 2 days	3kg/plant/2	LBP 2.000,00		LBP 12.000,00
Mekti مقتي	seedlings: 2 months	every 2 days	seedlings: May	May to September	every 2 days	3kg/plant/2	LBP 2.000,00		LBP 12.000,00
Peas (bazella)	seeds: 2 months	Harvest mature fruits	seeds: March	March to July	3	1kg/plant/10	LBP 2.500,00		LBP 25.000,00
Loubye	seeds: 2 months	Harvest mature fruits	seeds: March	March to July	3	2kg/plant/10	LBP 4.000,00		LBP 80.000,00
Rashad	seeds: 25 days	Every 15 days	seeds: any time	All Year	5(summer)-10 (winter) harvest	8	LBP 500,00	LBP 4.000,00	LBP 48.000,00
Radish (monthly radish)	seeds: 1 month	once	seeds: any time	All Year	12	10	LBP 500,00	LBP 5.000,00	LBP 60.000,00
Mint	roots: 10 days in summer	Every 10 days	roots: April	All Year	25	8	LBP 500,00	LBP 4.000,00	LBP 100.000,00
Squash	seedlings: 1.5 months	Day after day when mature	seedlings: June	June to September	Day after day	5kg/plant/2	LBP 3.000,00		LBP 30.000,00

Legend:

- 1 Bunch of Onions is made-up of 3 onions.
- 1 Bunch of Garlic is made-up of 5-6 garlics.
- 1 Bunch of Swiss Chard or Dandelion is made-up of 20 leaves
- 1 Bunch of Radish is made-up of 10-12 radishes
- 1 Bunch of Mint or Rashad takes-up to 10 cm²
- 1 Bunch of Celery is made-up of 5-6 leaves
- 1 Bunch of Marjoram or Thyme is approximately 1 cup

Table 22: Yields calculated vertical kits. Source: provided by ESDU

Economic values calculated for vertical kit:

Estimated economic value of the produced crops

"Building the Food Security and Economic Resilience of Syrian Refugees and Vulnerable Members of their Host Communities in Beirut/Lebanon"

Type of Crop	Time to maturity (1st harvest)	Harvest (when mature)	Planting time	Growing Season	Average number of Harvests	Average yield (bunches) per bottle	Average price (LBP)/Unit	Approx. Revenue (LBP)/Harvest	Approx. Total Revenue (LBP)/bottle/season
Celery	seedlings: 1 month	Every 15 days	seedling: October	September to February	12	1	LBP 2.000,00	LBP 2.000,00	LBP 24.000,00
Lettuce	seedlings: 2 months	once	seedling: October	September to November	1	1	LBP 1.500,00	LBP 1.500,00	LBP 1.500,00
Green Onions	bulb: 20 d	Better once	bulbs	Can be grown all Year round	12	1	LBP 833,33	LBP 833,33	LBP 10.000,00
Green Garlic	bulb: 20 d	Better once	bulbs	Can be grown all Year round	12	1	LBP 1.666,67	LBP 1.666,67	LBP 20.000,00
Cherry Tomatoes	seedlings: 2 months	Harvest mature fruits	seedling: April	April to September	Harvet mature fruits	800g	LBP 6.000,00	LBP 6.000,00	LBP 24.000,00
Hot Peppers	seedlings: 2 months	Harvest mature fruits	seedling: April	April to September	Harvet mature fruits	400g	LBP 2.000,00	LBP 4.000,00	LBP 4.000,00
Marjoram	seedlings: 1 month	Every Month	all year	All Year	8	1	LBP 4.000,00	LBP 4.000,00	LBP 32.000,00
Thyme	seedlings: 1 month	Every Month	seedling: Jan	All Year	5	1	LBP 1.000,00	LBP 1.000,00	LBP 5.000,00
Rosemary	seedlings: 1 month	Every Month	seedling: March	All Year	15	1	LBP 4.000,00	LBP 4.000,00	LBP 60.000,00
عطر	seedlings: 1 month	Every Month	seedling: March	All Year	10	1	LBP 4.000,00	LBP 4.000,00	LBP 40.000,00
Mint	seedlings: 1 month	Every 20 days	seedling: March	All Year	25	1	LBP 500,00	LBP 500,00	LBP 12.500,00
Sage	seedlings: 1 month	Every Month	seedling: March	All Year	10	1	LBP 2.000,00	LBP 2.000,00	LBP 20.000,00
Green Tea	seedlings: 1 month	Every Month	seedling: April	All Year	10	2	LBP 2.000,00	LBP 4.000,00	LBP 40.000,00
Basile	seedlings: 1 month	Every 15 days	seedling: June	June to November	15	1	LBP 2.000,00	LBP 2.000,00	LBP 30.000,00

every plant of
marjoram,
thyme,
Every 3 plants
of basile = 1
bunch
rosemary,
geranium, mint,
sage and green
tea = 1 bunch

Table 23: Yields calculated for vertical kit. Source: provided by ESDU

Distribution dates of gardening kits to participants

<i>Date of kit delivery</i>	<i>Nr. of households</i>
21.01.2016	4 (testing kits)
26.05.2016	20
09.06.2016	20
09.11.2016	15
23.11.2016	14
Total	73

Table 24: Overview number of households receiving UA kits. Source: ESDU, 2016

Annex D: Profitability of Urban Agriculture in Africa

City	Typical net monthly income in US\$ per farm (if not mentioned otherwise) The highest income (if available) is given in brackets	Gross national income (GNI) per capita, US\$/ per month
Accra, Ghana	40-57	27
Bamako, Mali	10- (300)	24
Bangui, Central African Republic	320 (producers), 330 (wholesalers), 140 (retailers)	22
Banjul, Gambia	30	26
Bissau, Guinea-Bissau	24	12
Brazzaville, Republic of Congo	80-270 (producers), 120 (retailers)	53
Cotonou, Benin	50- (110)	36
Dakar, Senegal	40- 66 (250)	46
Dar Es Salaam, Tanzania	60	24
Ho Chi Minh City, Viet Nam	40-80 (125)	n.a.
Hyderabad, India	30-70 (figures per ha)	n.a.
Freetown, Sierra Leone	10-50	13
Jakarta, Indonesia	30-50	n.a.
Kumasi, Ghana	35-85 (120-160)	27
Lagos, Nigeria	53-120	27
Lomé, Togo	30-25 (270-330)	26
Nairobi, Kenya	10-163 (279)	33
Niamey, Niger	40	17
Ouagadougou, Burkina Faso	14-70 (100);	25
Takoradi, Ghana	10-30	27
Yaoundé, Cameroon	34-67	53

Table 25: Monthly net income from irrigated mixed vegetable farming. Source: Veenhuizen & Danso, 2007

Annex E: List of Crops provided to participants

Cool Season Crops Not Affected by Frost
Asparagus Cabbage Kale Pea Spinach Radish Broccoli Garlic Onions Shallots

Cool Season Crops Affected by Frost
Beets Carrots Cauliflower Potato Lettuce Swiss Chard

Warm Season Crops
Squash Watermelon Cucumber Pepper Sweet Corn Eggplant Tomato

Summer/Spring Crops
Beans Sweet Corn Peppers (Hot; Sweet-Bell) Sweet Potatoes Pumpkins Squash Cucumber Eggplant Okra Tomatoes Watermelons Zucchini

Fall/Winter Crops
Broccoli Cabbage Carrots Cauliflower Onion Pea White Potatoes Radish Celery Garlic Kale Lettuce Onion (bulb)

Source: provided by ESDU

Annex F: Summary of Data Relevant to Research Question 6: Lessons learned of the project

Pillar II: Summary of challenges and opportunities from ESDU monitoring reports

The following information are drawn from the six monitoring reports on the project created by ESDU. They comprise a compilation of the remarks on opportunities and challenges encountered prior and during the project implementation.

ESDU states, that in order to identify potential beneficiaries, the local authorities, as the municipality of Bourj Hammoud and community based organizations (CBO), had to be approached and identified. This process took much longer than expected, which delayed the project plan. This contributed to a decrease in the number of potential beneficiaries, as each potential beneficiary household had to be visited and assessed. While originally 150 households were supposed to take part in the project, less than the half (72) were integrated in the end.

According to ESDU around 100 households were visited and assessed, however, some owners did not allow to plant on the roof top or balconies. A major fallback during this phase was, that many of the visited Syrian families lived in small rooms with no balconies or were not allowed access to the rooftops and were such not eligible to participate. However, during the conducted visits an opportunity was seen in the excitement of women having their own urban agricultural production unit to enable them to produce healthy food and contribute to the diversification of their diet while decreasing their food expenditures. The participation of beneficiaries in the preparation and information workshop also turned out to be helpful to recruit additional participants through word of mouth propaganda.

An important and useful step was to intensively pre-test the garden kits, first in a community center and then later on the ground by starting off with four pilot-gardens managed by four beneficiaries at their homes. By doing so it was ensured, that both the vertical and horizontal kits were productive and gave crops of good quality. The initially planned distribution of sun-driers was dismissed as the production was cost intensive and only around 4 kits would have been developed. These should have been placed on a roof exposed to sunlight and shared by beneficiaries, however, it was deemed too delicate to allow different families to access the roof of a building where they do not live. During the household's assessment visits and the implementation phase another encountered challenge was that some families dropped out of the project as Syrian families were leaving Lebanon or moved to new houses, along with unclear reasons. Further, lack of details in the given addresses made follow-up visits difficult for the ESDU team difficult. Another major impairment of the project that possible had effects on the outcome was the incident, that the funds ran out before the implementation phase was over. The funds were replenished by the project investors but rapidly became scarce again.

In regard to the distribution of the garden challenges occurred as it was not evaluated practical to distribute the kits at every household as allocating houses and dealing with incorrect addresses turned out to be very time consuming. To evade such difficulties, it was first attempted to deliver the equipment at determined points such as local NGOs and facilitators, and ask the participants to take them home. Project technicians can later visit the houses and help installing the kits. However, during the workshops it turned out that participants lacked capacities to transport the kits home. As a result, there was no other option found than distributing the kits by ESDU. Another challenge was to transport the kits and material to the roofs of old buildings with no elevators.

During follow up-visits, it was noticed that many households asked for more seeds, which, however, could not be provided due to the limited project budget.

A great opportunity during the implementation phase was to incorporate modern communication tools as smartphone based chats which allowed the trainers to reach out to the agricultural engineers and send them pictures of unknown pests or diseases and to transmit a fast advice.

Source: ESDU Monitoring Reports

Pillar III: Information on Constraints from Cleared Surveys

Some additional constraints and opportunities were drawn from participant's responses when they made use of the "other: ____" option attached to most questions of the survey to provide additional information on a certain topic if relevant but also from the 10 surveys that were taken out from the data analysis as they were not filled completely or where gardening was abandoned after 1-4 weeks.

One participant remarked, that she hopes that the project will be repeated, which will be elaborated in the discussion section.

remarked, that their plants were exposed to sun and wind that harmed the plants and birds eating their plants. They also reported to not have had sufficient water which led the garden dry out. It is likely that the latter responses came from the participants who had their kit installed end May/early June when the weather can be already very hot in Beirut. One participant who stopped gardening reported that the owner of the building was reluctant to having the garden on the rooftop.

Source: Conducted Surveys

Annex G: Research Questions and Related Questions of Questionnaire

Research Question	Corresponding Question in the Questionnaire (Q) and answer type (Likert=L; Multiple Choice=MC; Contingency=C; Open-Ended=OE; Dichotomous=D; Other=O)
[1] What is the prevalence, severity and duration of food insecurity among participant's households?	[Q28/MP] *Six-item Food Security Indicator Module*
[2] Do the urban gardens increase the availability of food and calories among participant's households?	[Q19] ¹⁰⁹ How has your garden affected your/your households spending for food? <i>MC</i> [Q20] As a result of the project, has your access to fruits and vegetables increased? <i>D</i> [Q15] (A table was to be filled with the interviewer on what was produced and how the share of the harvested produce dedicated to consumption or selling) <i>O</i> [Q18] On a scale from 0 to 10 how much does your garden produce cover your food consumption? <i>L</i> [Q27] ¹¹⁰ How did you benefit from your garden? <i>MC</i>
[3] Do the urban gardens contribute to increased fruit and vegetable intake and increased dietary diversity among participant's households?	[Q20] As a result of the project, has your fruit and vegetable access increased? <i>D</i> [Q21] As a result of the project, how have your consumption and purchase patterns increased, decreased or stayed the same for the following 6 food types: vegetables, fruit, dairy/eggs, meat, bread, rice/lentils/beans? <i>O</i>
[4] What impact does gardening have on female participants? What are possible positive implications from that for the food security of their households?	[Q27] How did you benefit from your garden? <i>MC</i>
[5] Did cash availability of households increase through their urban garden activity? How did the participants spend this extra cash?	[Q14] What are you doing with the food produced in your garden? <i>MC</i> [Q16] Did you make profit by selling your produce or did your spending for material exceed the money you made? <i>MC</i> [Q17.1] What did you use the money for you saved with producing your own food? <i>MC</i> [Q17.2] What did you use the money for you generated from selling produce use? <i>MC</i>
[6] What are the lessons learned from the project?	[Q22.1] Did you have problems to afford seeds and fertilizer? <i>D</i> [Q22.2] Did you have problems finding seeds and fertilizer? <i>D</i> [Q22.3] Did you always have enough water for your plants? <i>D</i> [Q24] Did the participation in the project meet your expectations? <i>MC</i> [Q24.1] If no, was it because you aspired to grow bigger amounts? [Q24.1] If no, was it because you aspired to grow different crops? [Q24.1] If no, was it because you aspired to benefit more financially? [Q25] Do you plan to continue growing plants in your garden? <i>D</i> [Q26] Would you suggest urban gardening to others? <i>D</i> [Q23] Did you have experience with gardening/farming before the project? <i>MC</i>

¹⁰⁹ Is combined with [Q20] to deduce on increased food availability

¹¹⁰ Relevant answer option from multiple choice: "Improved quality of food" to deduce on nutrient provision

Demographic data	<p>[Q1] What is your nationality? <i>D</i></p> <p>[Q2] What is your age? <i>OE</i></p> <p>[Q3] What is your gender? <i>D</i></p> <p>[Q4] What is your relation to the head of your family, the person who makes the major decisions? <i>MC</i></p> <p>[Q5] What is the highest level of education you have achieved? <i>MC</i></p> <p>[Q6] Did you contribute in any way to the income of your household before the project (including occasional jobs)? <i>D</i></p> <p>[Q7] Please state the number of adults and children in your household: (...) <i>O</i></p> <p>[Q29] How many members contribute to the income of the household? <i>OE</i></p> <p>[Q30] What are the household's income sources? <i>OE</i></p>
Garden related data and other data related to food*	<p>[Q11] Which of the following components are part of your garden? <i>MC+OE</i></p> <p>[Q12] How many trainings/workshops sessions of the project did you attend? <i>OE</i></p> <p>[Q13] Where do you get water for your garden? <i>MC</i></p> <p>[Q15] (A table was to be filled with the interviewer on what was produced and how the share of the harvested produce dedicated to consumption or selling) <i>O</i></p> <p>[Q23] Did you have experience with gardening/farming before the project? <i>MC</i></p> <p>[Q14] What are you doing with the food produced in your garden? <i>MC*</i></p> <p>[Q8] In a usual week, where do you get your food from? <i>MC*</i></p> <p>[Q9] How is food distributed within your family? <i>MC*</i></p> <p>[Q10] Has this pattern changed since participating in the project? <i>D*</i></p> <p>[Q10.1] If yes, how? <i>C+O*</i></p>

Table 26: Research questions and related questions of the survey

Evaluation survey of urban garden project

***Please read the following introduction to the surveyed beneficiary*:**

This questionnaire has been developed to gather feedback regarding the impact of your urban garden on your household.

The survey further strives to explore challenges you faced with your garden and how well your experiences in the urban garden project have met your expectations. With your help you can contribute to improve similar projects in the future in order to achieve the best results possible for involved participants.

The survey should take around 25-30 minutes and your responses are completely anonymous. If you feel uncomfortable answering any questions, you can skip the question or withdraw from the survey.

1. What is your nationality?

- ☐ Syrian ☐ Lebanese ☐ Other _____

2. What is your age? _____ years

3. Gender

- ☐ Female ☐ Male

4. What is your relation to the head of your family, the person who makes the major decisions?

- ☐ Myself ☐ my husband ☐ my wife
☐ my father ☐ my mother ☐ Other: _____

5. What is the highest level of education you have achieved?

- ☐ No formal education ☐ Intermediary school ☐ Vocational training
☐ Primary school ☐ University degree
☐ Other: _____

6. Did you contribute in any way to the income of your household before the project (including occasional jobs)?

- ☐ Yes ☐ No

7. Please state the number of adults and children in your household:

Number of adults: _____

Number of children: _____

Age of each child: _____ | _____ | _____ | _____ | _____ | _____
_____ | _____ | _____ | _____ | _____ | _____

8. In a usual week, where do you get your food from (Please red all options to the participant, multiple answers possible)

- ☐ Supermarket and local shops ☐ Friends & neighbours ☐ Food Vouchers
☐ Family ☐ Own production ☐ Other: _____

9. How is food distributed within your family:(Please red all options to the participant)

- ☐ Prioritize children
☐ Prioritize male members of the household
☐ Prioritize female members of the household
☐ Prioritize head of household
☐ Prioritize elder family members
☐ Other: _____

10. Has this pattern changed since participating in the project?

- ☐ no ☐ if yes, please state how:

(Please write clearly)

11. Which of the following components are part of your garden (Please read all options to the participant):

- ☐ Number of horizontal plastic crates: _____
☐ Number of vertical plastic bottles: _____
☐ Use of solar drying unit
☐ Composting unit

12. How many trainings/workshops sessions of the project did you attend?

_____ (write number)

13. Where do you get water for your garden?

- ☐ Pipe water ☐ Tank water ☐ Rainwater collection ☐ Other: _____

14. What are you doing with the goods produced with your garden? (please read to the participant) (cross all that applies)

- ☐ Household consumption ☐ Selling produce on market/street
☐ Selling to friends or neighbours

15. Please fill the table with the participant:

Produce	Cross all that were produced (x)	Insert estimated percent of total produce used for own consumption	Estimated percent of total produce used for selling
Herbs & Spices		%	%
Celery		%	%
Lettuce		%	%
Garlic		%	%
Rosemary		%	%
Marjoram		%	%
Thyme (Za'atir)		%	%
Mint		%	%
Green Tea		%	%
Basil		%	%
Parsley		%	%
Sage		%	%
عطرة		%	%
Other vegetable		%	%
Green Onions		%	%
crumps		%	%
Hot Peppers		%	%
Cherry Tomatoes		%	%
Tomatoes		%	%
Jew-mallow		%	%
eggplant		%	%
cucumber		%	%
carrot		%	%
Spinach		%	%
Fruit		%	%
Strawberries		%	%
Watermelon		%	%

Please ask for other things produced and included them on the table on the next side


Produce	Cross all that were produc ed (x)	Insert estimated percent of total produce used for own consumption	Estimated percent of total produce used for selling
Herbs & Spices		%	%
		%	%
		%	%
		%	%
		%	%
		%	%
		%	%
		%	%
		%	%
		%	%
		%	%
		%	%
		%	%
		%	%
Other vegetable		%	%
		%	%
		%	%
		%	%
		%	%
		%	%
		%	%
		%	%
		%	%
		%	%
		%	%
Fruit		%	%
		%	%
		%	%



[only ask this question when produce was used for selling]

16. Did you make profit by selling your produce or did your spending for material exceed the money you made? (read all answer options)

- ☐ Yes, I made profit
 ☐ What I made equalled my expenses
 ☐ I spend more on material than what I gained from selling

 17. Left Question for own producers/right question for sellers

[only ask this question when produce was used for own consumption]	[only ask this question when produce was used for selling]
What did you use the money for you saved with producing your own food? (multiple answers possible)	What did you use the money for you generated from selling produce use? (multiple answers possible)
<input type="checkbox"/> Buying food <input type="checkbox"/> Buying non-food items <input type="checkbox"/> Paying debts <input type="checkbox"/> Savings <input type="checkbox"/> Rent <input type="checkbox"/> Sending money to family living abroad <input type="checkbox"/> Paying school fees <input type="checkbox"/> Other uses: _____ _____	<input type="checkbox"/> Buying food <input type="checkbox"/> Buying non-food items <input type="checkbox"/> Savings <input type="checkbox"/> Rent <input type="checkbox"/> Paying debts <input type="checkbox"/> Sending money to family living abroad <input type="checkbox"/> Paying school fees <input type="checkbox"/> Other uses: _____ _____

[only ask this question when produce was used for own consumption]

18. On a scale from 0 to 10 how much does your garden produce cover your food consumption? Read all answers to the participants options:

0 2 4 6 8 10

mark the one answer that was chosen

19. How has your garden affected your/your households spending for food?

- ☐ Spend less
 ☐ Same as before
 ☐ Spend more

20. As a result of the project, has your/your household's access to vegetable and/or fruit increased?

- ☐ yes
 ☐ no

21. As a result of the project, how have your consumption and purchase patterns increased, decreased or stayed the same for the following 6 food types:

Type	Consumption	Purchase
Fruits		
Vegetable (including herbs and spices)		
Dairy and Eggs		
Meat		
Bread		
Rice and Beans and Lentils		

Please use the following symbols to fill each box:

↑ = More
↓ = Less
- = Same



22. Please answer the following questions with yes or no concerning challenges with your garden:	yes	no
Did you have problems to afford seeds and fertilizer?		
Did you have problems finding seeds and fertilizer?		
Did you always have enough water for your plants?		
Other challenges you faced that are not listed:		



23. Did you have experience with gardening/farming before the project?

☐ Yes ☐ No

24. Did the participation in the project meet your expectations?
(read all possible answers)

Yes, my expectations were met

Yes, my expectations were exceeded

No because I was not able to produce the amount of F/V I wanted

No because I was not able to produce the types of F/V I wanted

No, I expected to generate more money

Other

25. Do you plan to continue growing plants in your garden?

☐ Yes ☐ No

26. Would you suggest urban gardening to others?

☐ Yes ☐ No

27. How did you benefit from your garden? (*read all answers to participants*)

- ☐ Generated extra income ☐ Enjoy gardening ☐ More stable food supply ☐ Increased self-esteem
☐ Created financial independence from head of family ☐ Improved quality of life ☐ Better food quality Other: _____
☐ Improving social life

|
28.

***Please read carefully the following statements to the participants.**

	Read the following statements to the beneficiary	Read the possible answers for each question	Insert number of the chosen answer
Q1	"The food that was bought just didn't last, and (I/we) didn't have money to get more." Was that often, sometimes, or never true for your household in the last 12 months?	1 = Often true 2 = Sometimes 3 = Never true 4 = Don't know/ refused to answer	—
Q2	"(I/we) couldn't afford to eat balanced meals." Was that often, sometimes, or never true for your household in the last 12 months?	1 = Often true 2 = Sometimes 3 = Never true 4 = Don't know/ refused to answer	—
Q3	In the last 12 months, since June last year did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?	0 = Yes (go to Q3.1) 1 = No (go to 4) 2 = Don't know/ refused to answer	—
Q3.1	How often did this happen - almost every month, some months but not every month, or in only 1 or 2 months?	1 = Almost every month 2 = some months but not every month 3 = Only 1 or 2 months	—
Q4	In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?	0 = Yes 1 = No 2 = Don't know/ refused to answer	—
Q5	In the last 12 months, were you ever hungry but didn't eat because you couldn't afford enough food?	0 = Yes 1 = No 2 = Don't know/ refused to answer	—

29. How many household members contribute to the income of your household?

_____ (write number)

30. What are the household's income sources? (**read all answers to participants)

- ☐ Employee Salary ☐ Borrowing ☐ Savings
☐ Own business ☐ Money from selling garden produce ☐ Money send from family
☐ occasional jobs ☐ Other: _____

31. What is the estimated average income per month in your household?

_____ LL

**** If they do not know please ask instead to provide below an estimated income range**

_____ LL to _____ LL

Annex H: Crops Cultivated among Households

<i>Fruits</i>	<i>Vegetables</i>	<i>Leafy Greens</i>	<i>Herbs/Spices</i>
Strawberries	Cucumber	Rocket	Rosemary
	Green Onions	Lettuce	Majoran
	Cherry Tomatoes	Parsley	Garlic
	Tomatoes	Jew Mallow	Cresson
	Eggplant	Spinach	Sage
	Carrot	Malfuf	Basil
	Hot peppers	Cilantro	Green Tea
	Crumps		Mint
	Celery		Thyme
			sweet bedstraw

Annex I: Baseline Study developed by YMCA

“Food Security for Vulnerable Households”

Name: _____ Family name: _____

Husband/Wife's name: _____

1. Are you or any of your family members involved in other project activities? If so, what is their name? Please indicate the activity(ies) concerned

2. What is your nationality?

☐ Syrian

☐ Lebanese

Other: _____

3. What is the composition of your household:

☐ Man

☐ Woman

Number of Children: _____

Name of children at home: Age: | Gender: | Source of income (yes/no)

_____ | _____ | _____

_____ | _____ | _____

_____ | _____ | _____

_____ | _____ | _____

4. How many people eat at home every day? _____
5. In the past [4 weeks/30 days] did you or any household member go to sleep at night hungry because there was not enough food? _____
6. How often did this happen in the past [4 weeks/30 days]? _____
7. What is the global **weekly** household income? _____
8. What are the sources of income?

☐ Employee Salary ☐ Private work ☐ Assistance ☐ Borrowing ☐ Saving

9. Who provides this/these income(s) _____

10. How many people currently earn an income within your household? _____

11. What is your current amount of debt? _____

12. What is your current amount of saving? _____

13. How much money do you spend on non-food expenditure per week (rent, utilities, transportation, schooling, and medical, recreational)? _____

And per month? _____

14. How much money do you spend on food per week? _____
15. How many trips to the market do you make every week to buy fresh produce? _____
16. How often do you eat fresh fruits and vegetables? (ask for each members of the family)
- _____

17. What fresh fruits and vegetables do you eat? (ask for each members of the family)

18. Does every member of the family eat equal quantities of fruits and vegetables?

19. What quantity of what is consumed at home each week is produced in the home?

20. What quantity of what is produced at home is sold each week?

21. Where/'To whom is it sold (market, neighbours, family, friends)? _____

22. What kind of equipment/technology do you use to produce food at home?

Source: Provided by ESDU

Annex J: Raw Data to Figures

<i>Crops</i>	<i>Households in %</i>
Lettuce	71
Hot peppers	66
Mint	56
Basil	49
Strawberries	49
Tomatoes	46
Eggplant	46
bedstraw	44
Green Onions	44
Parsely	39
Thyme	29
Celery	27
Rosemary	24
Cherry Tomatoes	24
Majoran	20
Jew Mellow	17
Garlic	17
Spinach	12
Sage	12
Green Tea	12
Cucumber	12
Carrot	12
crumps	10
Cresson	7
Malfuf	5
Coriander	5
Rocket	1

Table 27: Frequency of crops cultivated among all households

<i>Crop</i>	<i>Satisfied households in %</i>	<i>Unsatisfied Households in %</i>
Lettuce	83	66
Strawberries	83	34
Hot peppers	75	62
Tomatoes	75	34
Eggplant	67	38
Mint	58	55
Basil	58	45
Celery	50	17
Rosemary	50	14
Parsely	42	38
Green Onions	42	45
sweet bedstraw	33	48
Thyme	33	28
Carrot	33	3
Majoran	25	17
Cherry Tomatoes	25	24
Jew Mellow	25	14
Sage	25	7
Garlic	17	17
Spinach	17	10
Cucumber	17	10
Coriander	17	0
Cresson	17	3
Green Tea	8	14
crumps	8	10
Rocca	8	0
Watermelon	0	0
Raddish	0	0
Malfuf	0	7

Table 28: Frequency of cultivated crops among satisfied and unsatisfied households. Source: Author's survey

	<i>Applied Occasionally</i>	<i>Applied Frequently</i>	<i>Applied Never</i>	<i>Almost Every Month (10-12 months)</i>	<i>Some Months (3-8 months)</i>	<i>1-2 months</i>	<i>No</i>	<i>Yes</i>	<i>Answer Refused/ Did not know</i>
<i>Households in % and abso- lute:</i>									
<i>1. Were not able to afford a balanced meal</i>	51% 21hh	34% 14hh	10% 4hh						5% 2hh
<i>2. Had to cut or skip meals</i>							20% 8hh	80% 33h	
<i>2.1 How often did that occur?</i>				30% 10hh	39% 13h	27% 9hh			4%* 1h
<i>3. Food bought did not last</i>	59% 24hh	17% 7hh	24% 10hh						
<i>Interviewee in % and abso- lute:</i>									
<i>4. Felt like eating less than they should</i>							25%	73%	2%
<i>5. Felt hungry</i>							26%	68%	5%

Table 29: Detailed responses to the six-item Food Security Module. Source: Author's survey
all answers refer to the period of the last 12 months (June-August 2016-June-August 2017; *response was not decipherable

	<i>Enjoyed Gardening</i>	<i>Social Life</i>	<i>Self- Esteem</i>	<i>Improved Life Quality</i>	<i>Extra Income</i>	<i>Financial Independence</i>	<i>No other benefits</i>
All respondents (n=41) in % and absolute	80% 33h	37% 15hh	27% 11hh	12% 5hh	2% 1hh	0% 0hh	20% 8hh
Female respondents (n=40) in %	80% 32hh	35% 14hh	28% 11h	13% 5hh	3% 1hh	0%	20% 8hh

Table 30: Other positive benefits of the project. Source: Author's survey

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Declaration in lieu of oath

By

Verena Süß

This is to confirm my Master's Thesis was independently composed/authored by myself, using solely the referred sources and support.

I additionally assert that this Thesis has not been part of another examination process.

Location, Date

Signature
